Technical training.
Product information.

G12 Audio Systems

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General information

Symbols used

The following symbol is used in this document to facilitate better comprehension or to draw attention to very important information:

Contains important safety information and information that needs to be observed strictly in order to guarantee the smooth operation of the system.

Information status and national-market versions

BMW Group vehicles meet the requirements of the highest safety and quality standards. Changes in requirements for environmental protection, customer benefits and design render necessary continuous development of systems and components. Consequently, there may be discrepancies between the contents of this document and the vehicles available in the training course.

This document basically relates to the European version of left hand drive vehicles. Some operating elements or components are arranged differently in right-hand drive vehicles than shown in the graphics in this document. Further differences may arise as the result of the equipment specification in specific markets or countries.

Additional sources of information

Further information on the individual topics can be found in the following:

- Owner's Handbook
- Integrated Service Technical Application.

Contact: conceptinfo@bmw.de

The information contained in this document forms an integral part of the technical training of the BMW Group and is intended for the trainer and participants in the seminar. Refer to the latest relevant information systems of the BMW Group for any changes/additions to the technical data.

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BV-72/Technical Training

G12 Audio Systems

Contents

G12 Audio Systems

Contents

G12 Audio Systems

1. Introduction

Introduction to Headunit High 2

The 4th generation head unit with Navigation Professional **Headunit High 2** has gradually replaced the Headunit High since the end of 2014. The first vehicle with the new head unit was the new 2 Series convertible (F23). This was followed by the BMW 1 Series and 2 Series vehicles in March 2015 and the BMW 3 Series and 4 Series vehicles in July. The Headunit High 2 with completely revamped hardware will now also be offered in the **new BMW 7 Series (G12)** . The user interface (ID5++) for the new BMW 7 Series (G12) has also been completely redesigned.

Vehicle electrical system connection

With the Headunit High 2, a new bus system has been introduced. The "OPEN Alliance BroadR-Reach" (**OABR Ethernet**) is used for the data transmission between the head unit and telematic control unit. The topic of OABR Ethernet is dealt with in detail in the "G12 Telephone and telematic systems" training manual.

Navigation

In addition to the familiar update options for the map data, an automatic update is now also offered in combination with the Headunit High 2 with the introduction of the G12. Customers can benefit from automatic map updates in combination with a 3-year navigation map subscription. The head unit contains a new user interface and many new navigation features. These are described in the "G12 Navigation system" training manual. In addition, a number of sensors for the navigation system have been relocated to the surrounding vehicle electrical system environment.

Rear seat entertainment (RSE)

The rear seat entertainment system has also been updated in combination with the Headunit High 2. Alongside a new RSE control unit and a tablet PC to control the functions (called Touch Command), a host of new functions are now available in the vehicle.

Telematic systems and ConnectedDrive

A new telematic control unit is being introduced at BMW with the Headunit High 2. For the first time, the Telematic Communication Box 2 TCB2 offers the mobile radio standard Long Term Evolution (LTE) in the vehicle. LTE is used for the ConnectedDrive services (e.g. BMW Online, Internet), the telematic services (TeleService, Remote Services) and for the emergency call system Intelligent Emergency Call. This is complemented by a permanently installed Wi-Fi hotspot (SA 6WD) for the first time in the automotive industry. This hotspot also supports the LTE standard. You can find further information regarding the Wi-Fi hotspot in the "G12 Telephone systems" training manual.

Telephone, connectivity, player connection

A new feature in the G12 is that telephone with wireless charging is offered as standard equipment in the US market. the feature is BMW **Telephony with wireless charging** (SA 6WA), wireless charging of mobile phones. Further details on this are provided in the "G12 Telephone and telematic systems" training manual.

2 new versions of the snap-in adapter for the base plate for convenient telephone are offered for the new iPhone® 6. The generic snap-in adapter (Snap-in-Adapter Connect Universal) can be used for all iPhone versions (iPhone® 5, 5C, 5S, 6 and 6 Plus) with Lightning® connector (available since February 2015). In addition, a special iPhone®6 snap-in adapter is offered exclusively for the iPhone

G12 Audio Systems
1. Introduction

6® (available since April/May 2015). The snap-in adapter Universal 2.0 was introduced for Android® telephones in spring 2015. This supports all common Android® telephones in the areas of hands-free mode, charging, smartphone music player connection and Android® apps.

In addition, there are 2 USB interfaces in the G12 (second USB interface in combination with the standard equipment (in the US) Telephone with Wireless charging) which additionally permit connection of smartphones as music players via one-wire technology with all original (OEM) and BMW Accessories cables.

Bluetooth audio streaming is already present as standard equipment.

As **additional streaming variants**, the G12 also offer Screencast (via Wi-Fi®Direct) and Apps over the Air (via Bluetooth).

Speaker systems

2 hi-fi systems are offered in the G12. Each of the 2 systems has a hi-fi amplifier which is specifically adapted for each system. The Top HiFi system is the Harman Kardon Surround Sound System (SA 688) is offered as the standard system.

And for the first time at BMW, a High End system is offered in cooperation with Bowers & Wilkins. The system can be ordered by the customer as optional equipment (SA 6F1).

G12 Audio Systems
2. Headunit High 2 (HU-H2)

2.1. History and new development

2.1.1. From CCC to HU-H2

From the Car Communication Computer to the Headunit High 2

An overview of the different versions of the large head unit (head unit with Navigation Professional) is provided below.

Generations	Designation/year
1st generation	Car Communication Computer (CCC) (2003)
2nd generation	Car Information Computer (CIC) (2008)
3rd generation	Headunit High (2012)
4th generation	Headunit High 2 (2014)

2.1.2. Headunit High 2

The following chapter on the 4th-generation head unit with Navigation Professional covers the following topics:

- Headunit High generations
- Headunit High 2: Application scenario and versions
- Bus overview, system wiring diagram, functional wiring diagram, OABR Ethernet
- OABR Ethernet

2.2. Generations

At BMW, the head unit family is now in its 4th generation. A brief overview of the previous head units used at BMW, which have a **Central Information Display (CID)**, can be found below. The following table contains the different designations from the individual departments of the BMW Group. The previous versions of Radio Professional are differentiated in the 1st table. This corresponds to the basic equipment of the G12 (not available in the US market).

The second table lists the previous versions of the head units with Navigation Professional. The Headunit High 2 is also used for this function in the G12. A Business navigation system is not offered for the G12.

G12 Audio Systems

2. Headunit High 2 (HU-H2)

2.2.1. Radio Professional

Manufacturer & (SA code/ Generation)	Marketing	Technical Qualification	Diagnostics	Development Specification	Series introduction as from E60 (2003)
Harman/ Becker (SA 663/1)	Radio Business (without MP3 function); Radio Professional	Multi-Audio-System-Controller M-ASK (CHAMP US)	Multi-Audio-System-Controller M-ASK (CHAMP US)	Multi-Audio-System-Controller M-ASK (CHAMP US)	E63, E60 (2003)
Harman/ Becker (SA 663/2)	Radio Professional	Car Information Computer Basic	CIC	CIC MID	F10 (until 09/2010)
Alpine (SA 663/2)	Radio Professional	Car information computer basic 2	CHAMP	CHAMP 2	F10 (from 09/2010)
Magneti Marelli (SA 663/3)	Radio Professional	Headunit Basic (HU-B)	Headunit Basic (HU-B)	Entry Media	BMW F3x, F2x (07/2014)
Magneti Marelli (SA 6FW/3)	Media system	Headunit Basic (HU-B)	Headunit Basic (HU-B)	Entry Media	BMW F48 (09/2015)

2.2.2. Navigation Professional

Manufacturer & (SA code/ Generation)	Marketing	Technical Qualification	Diagnostics	Development Specification	Series introduction as from E60 (2003)
Siemens/ VDO (SA 601 or 609/1)	Navigation Professional	Car Communication Computer CCC	Car Communication Computer (CCC)	Car Communication Computer (CCC)	E63, E60 (2003)
Harman/ Becker (SA 601 or 609/2)	Navigation Professional	Car Information Computer	CIC	CIC High	E8x, E9x (2008)
Harman/ Becker (SA 601 or 609/3)	Navigation Professional	Headunit High (HU-H)	Headunit High (HU-H)	NBT	F01 LCI (2012)

G12 Audio Systems
2. Headunit High 2 (HU-H2)

2.3. Application scenario and versions

Brand, development code; (series)	Headunit High 2
BMW; G12 (BMW 7 Series)	**07/15 with new user interface 2015 (ID 5++)**
BMW; F23 (2 Series Convertible)	11/14 with current user interface (ID 4++)
BMW; F2x (BMW 1 Series and 2 Series Coupé)	03/15 with current user interface (ID 4++)
BMW; F3x (BMW 3 Series and 4 Series)	07/15 with current user interface (ID 4++)
BMW; F48 (BMW X1)	9/15 with current user interface (ID 4++)
I01 (BMW i3)	With new user interface probably in 2016 (ID 5++)
I12 (BMW i8)	No planned date at the moment

2.4. System overview

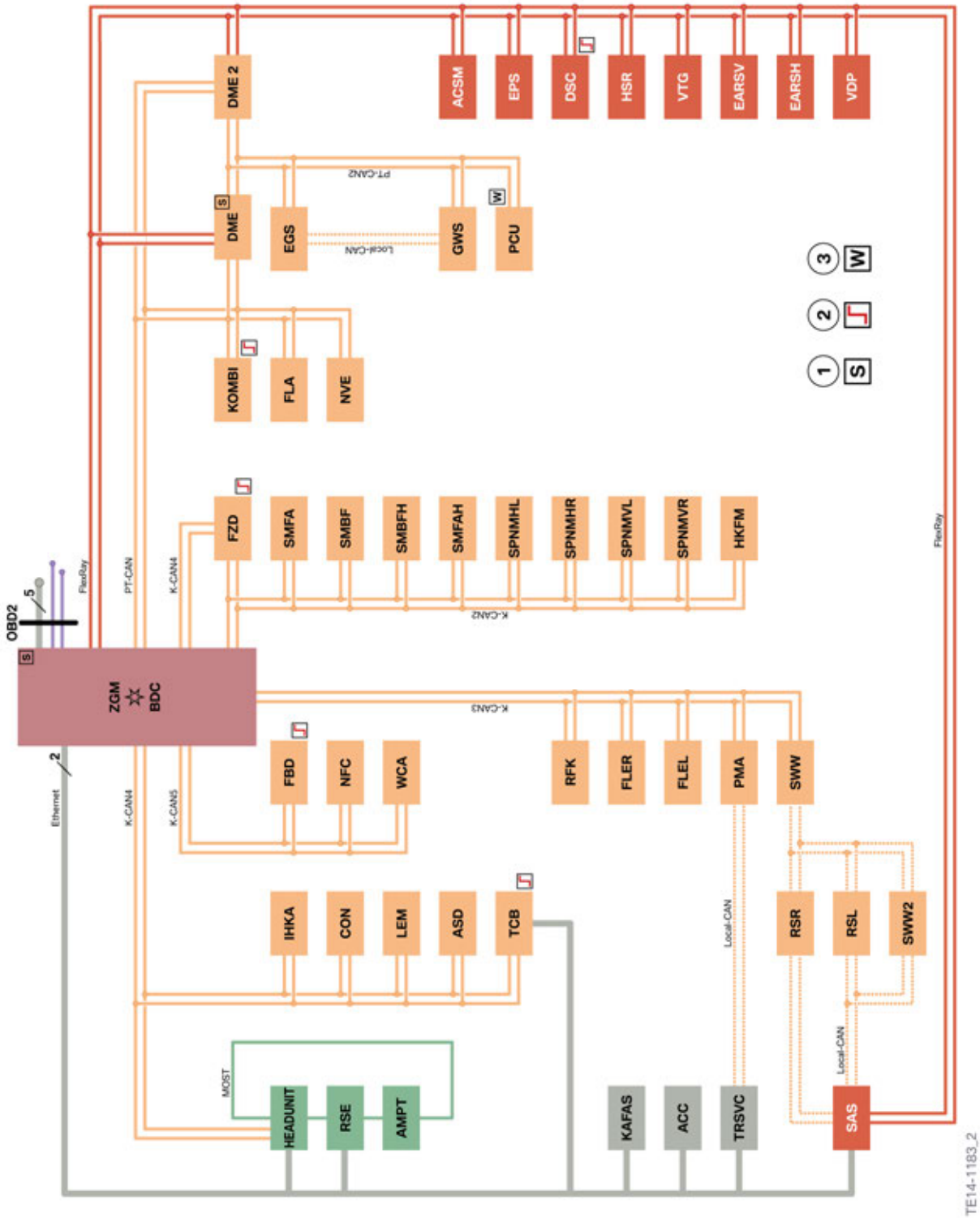
The fundamental parts of this training manual include a bus overview, vehicle electrical system connection of the Headunit High 2 and functional wiring diagram. Since it is not possible to anticipate all training manuals and it is additionally wished to preserve clarity, further wiring diagrams for the Headunit High 2 can be found in the following training manuals:

Topic	Training Manual
Antenna system in G12	"G12 Telephone and telematic systems"
Convenient telephone (includes USB audio in the base plate and USB video via the USB audio interface) and with Screencast as new feature.	"G12 Telephone and telematic systems"
Rear seat entertainment in G12	"G12 Rear seat entertainment"
Speakers in G12	Chapter 5 "Speakers and amplifiers" of this training manual
Camera systems in G12	"G12 Assistance systems"

G12 Audio Systems

2. Headunit High 2 (HU-H2)

2.4.1. Bus overview



G12 bus overview

G12 Audio Systems
2. Headunit High 2 (HU-H2)

Abbreviation	Explanation
ACC	Active cruise control
ACSM	Crash Safety Module
AMPT	Amplifier Top (amplifier of the Top HiFi system)
ASD	Active Sound Design
BDC	Body Domain Controller
CON	Controller
DME	Digital Motor Electronics
DSC	Dynamic Stability Control
EARSH	Electric active roll stabilization rear
EARSV	Electric active roll stabilization front
EGS	Electronic transmission control
EPS	Electromechanical Power Steering
FLA	High-beam assistant
FLER	Frontal Light Electronics Right
FLEL	Frontal Light Electronics Left
FZD	Roof function center
GWS	Gear selector
HEADUNIT	Headunit High 2
HKA	Automatic rear air-conditioning and heating
HKFM	Tailgate function module
HSR	Rear axle slip angle control
IHKA	Integrated automatic heating / air conditioning
KAFAS	Camera-based driver support systems
KOMBI	Instrument panel
LEM	Light Effect Manager
NFC	Near Field Communication
NVE	Night Vision Electronics
PCU	Power Control Unit
PMA	Parking maneuvering assistant
RFK	Reversing camera
RSE	Rear Seat Entertainment
RSL	Radar Sensor Left (avoidance assistant)
RSR	Radar Sensor Right (avoidance assistant)
SAS	Optional equipment system
SMBF	Seat module, passenger

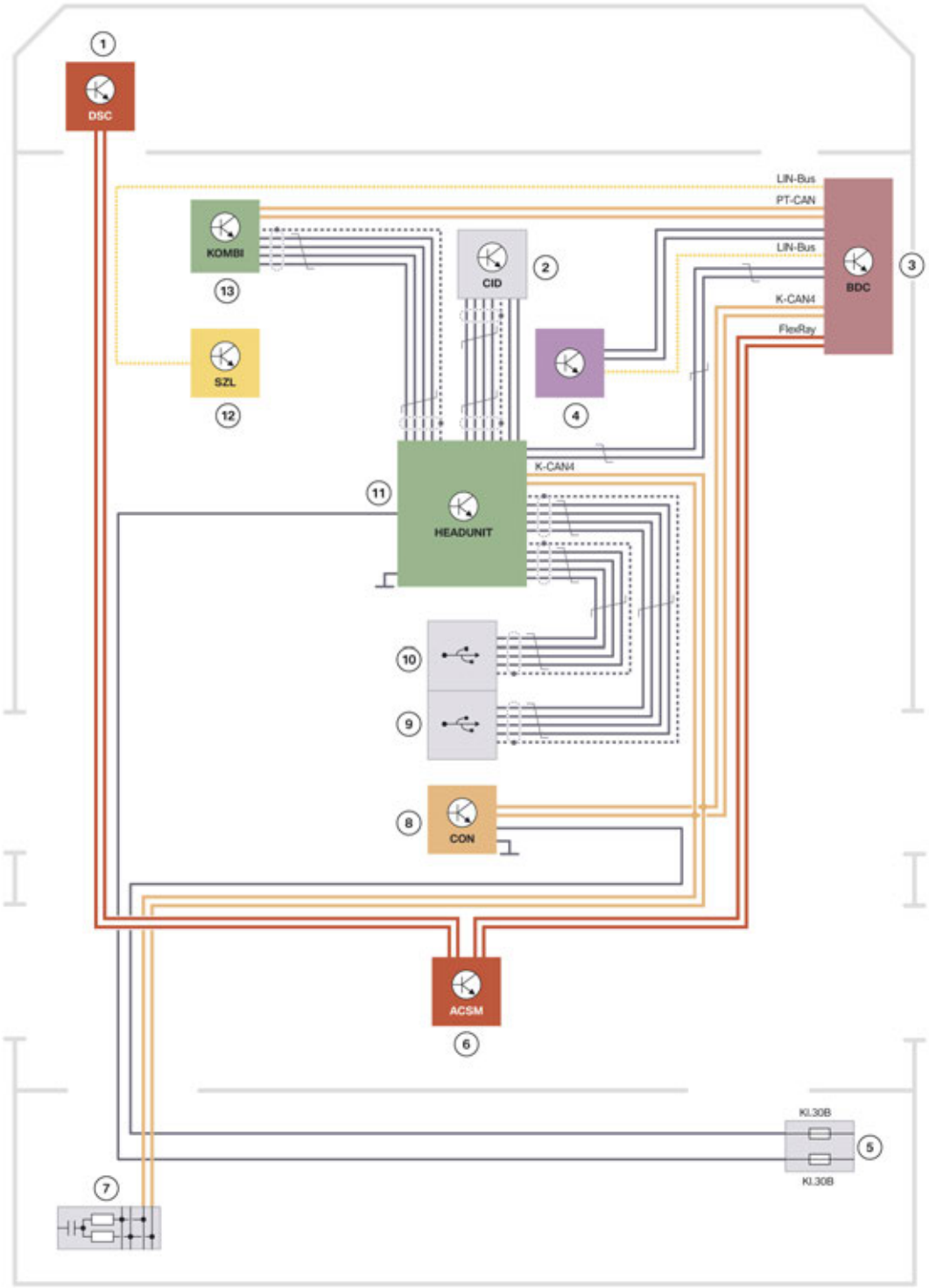
G12 Audio Systems
2. Headunit High 2 (HU-H2)

Abbreviation	Explanation
SMFA	Seat module, driver
SMFAH	Seat module, driver, rear
SPNMHL	Seat pneumatics module back left
SPNMHR	Seat pneumatics module back right
SPNMVL	Seat pneumatics module front left
SPNMVR	Seat pneumatics module front right
SWW	Lane change warning (primary)
SWW2	Lane change warning (secondary)
TCB2	Telematic control unit 2
TRSVC	Control unit for rear view camera and SideView
VDP	Vertical Dynamic Platform
VTG	Transfer box
WCA	Wireless charging tray
1	Start-up node control units for starting and synchronizing the FlexRay bus system
2	Control units with wake-up authorization
3	Control units also connected at terminal 15WUP

G12 Audio Systems

2. Headunit High 2 (HU-H2)

2.4.2. System wiring diagram HU-H2



Headunit High in the G12

G12 Audio Systems

2. Headunit High 2 (HU-H2)

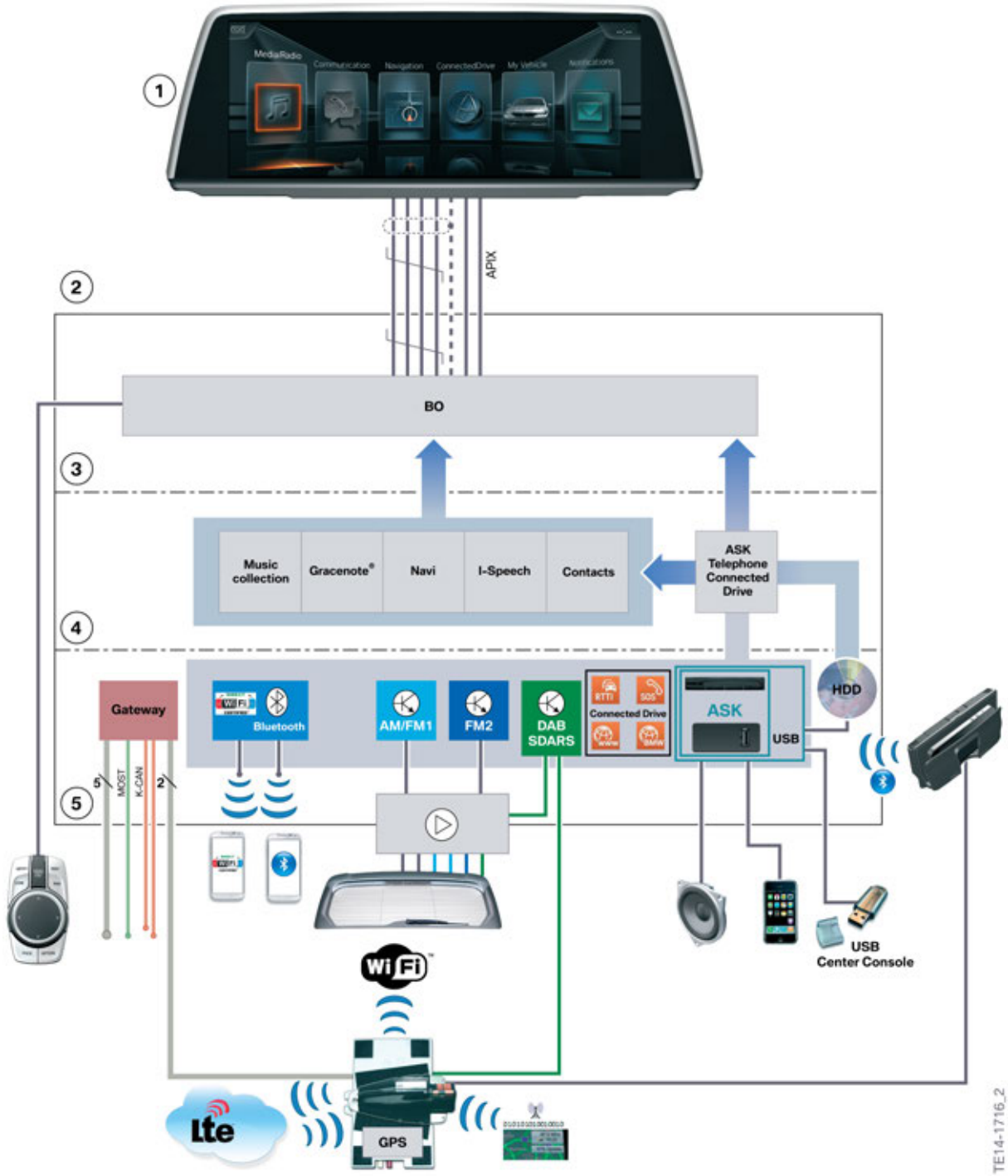
Index	Explanation
1	Dynamic Stability Control (DSC)
2	Central Information Display (CID)
3	Body Domain Controller (BDC)
4	Audio control panel
5	Power distribution box, rear
6	Crash Safety Module (ACSM)
7	CAN terminator
8	Controller CON
9	USB interface in the center console (standard equipment)
10	USB interface in the center armrest (with SA 6NS or 6WC)
11	Head unit
12	Steering column switch cluster (SZL)
13	Instrument panel (KOMBI)

G12 Audio Systems

2. Headunit High 2 (HU-H2)

2.4.3. Functional wiring diagram for Headunit-H2

The functional wiring diagram of the Headunit High 2 HU-H2 is shown below, here with TCB2.



Functional wiring diagram of HU-H2 with TCB2

G12 Audio Systems
2. Headunit High 2 (HU-H2)

Index	Explanation
1	Central Information Display (CID)
2	Headunit High 2
3	User interface
4	Application/software
5	Interfaces / Hardware connection

2.4.4. New Ethernet

History

Ethernet with 5-lines or 4-lines.
Since the F01, **Ethernet** has been used at BMW for vehicle programming and for updating the map data of the navigation systems with **5 lines** (4 x data lines and 1x activation line of the OBD interface including shielding).

Another Ethernet connection is installed in F0x or F1x vehicles: a **5-wire Ethernet system** from the BDC to the head unit or from the head unit to the Rear Seat Entertainment (RSE). Four data lines are used here for transmission of the navigation data for the RSE. An activation line is not required.

Both Ethernet variants are comparable with the standard Ethernet variant 100BASE–TX in PC networks. The Ethernet version with 5 lines is **still** used in the G12 from the OBD2 interface to the Body Domain Controller.

New

Ethernet with 2 lines

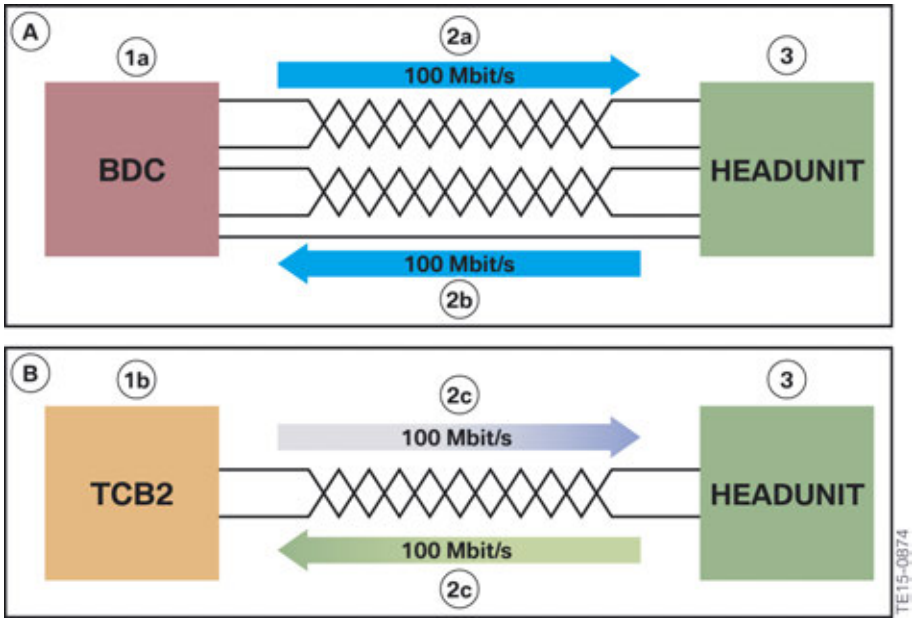
In the G12, the Headunit High is connected with the Telematic Communication Box 2 TCB2 by means of a **new Ethernet version** for the first time in the BMW 7 Series. Unshielded Twisted Single Pair is an Ethernet variant which was developed by the OPEN Alliance BroadR-Reach. These are two-wire, twisted and unshielded lines for data transfer. At BMW, this Ethernet is called "**OABR Ethernet**", which has been especially adapted for the automotive sector.

The data rate for an OABR Ethernet connection is up to maximum of 2 x 100 Mbit/s.

A comparison of the previous connection between BDC and head unit (5-wire Ethernet) and the new variant (2-wire Ethernet) can be found below.

G12 Audio Systems

2. Headunit High 2 (HU-H2)



OABR Ethernet in comparison with conventional 2–wire Ethernet

Index	Explanation
A	5-wire standard Ethernet 100BASE–TX
B	2-wire OABR Ethernet
1a	Body Domain Controller (BDC)
1b	Telematic Communication Box 2 (TCB2)
2a	"Transmit" data line with 100 MBit/s
2b	"Receive" data line with 100 MBit/s
2c	Simultaneous transmission and reception with 100 MBit/s + 100 MBit/s, 2c in double version as it is a differential signal.
3	Head unit

Hardware advantages

One of the first options is the transmission of vehicle camera data (F15). The advantage of Ethernet is that vehicle cameras (IP-based) are not only connected to one control unit, but several control units can access the data flows of the vehicle cameras. The network is therefore very flexible and is well prepared for the future.

Another important advantage is the fast programming of control units. The programming times are reduced significantly via Ethernet. Whereas a CAN bus can only transmit data with a maximum length of 8 bytes per message, Ethernet messages have a length of over 1500 bytes. The user data rate thus increases: Considerably more message packages can be transmitted in a shorter period.

Other applications such as the control unit communication, the networking of vehicles with the environment and diagnosis usages, will also increase the importance of Ethernet. Furthermore, with a OABR Ethernet connection only two lines (instead of the previous five lines with Ethernet) are used, meaning additional weight and costs can be saved. Details on data transfer, the physical layer and layer model are explained in the "G12 Bus systems" training manual.

G12 Audio Systems

3. HU-H2 Hardware

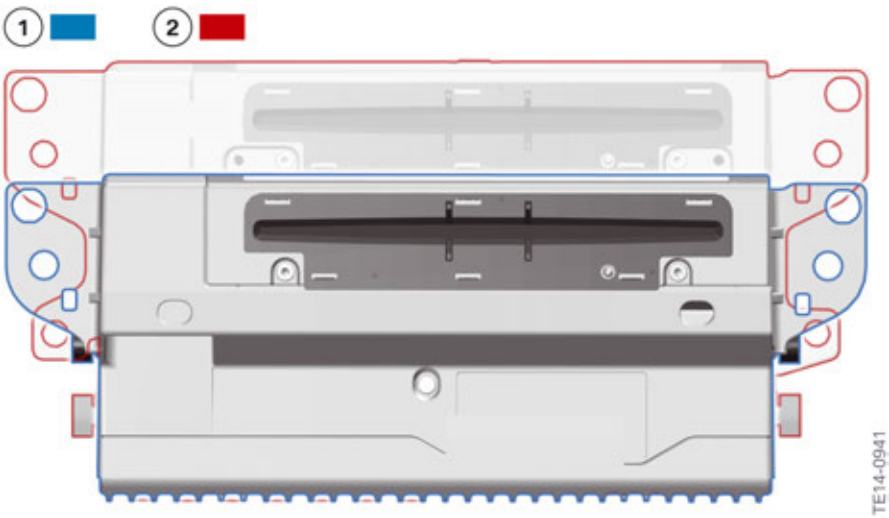
3.1. System components

3.1.1. Exterior view

The Headunit High 2 is the **successor model** to the Headunit High introduced in 2012. The G12 is the first vehicle in which the new HU-H2 with new user interface will be installed.

The manufacturer for the European and US versions is Harman®.

Front view with silhouette comparison

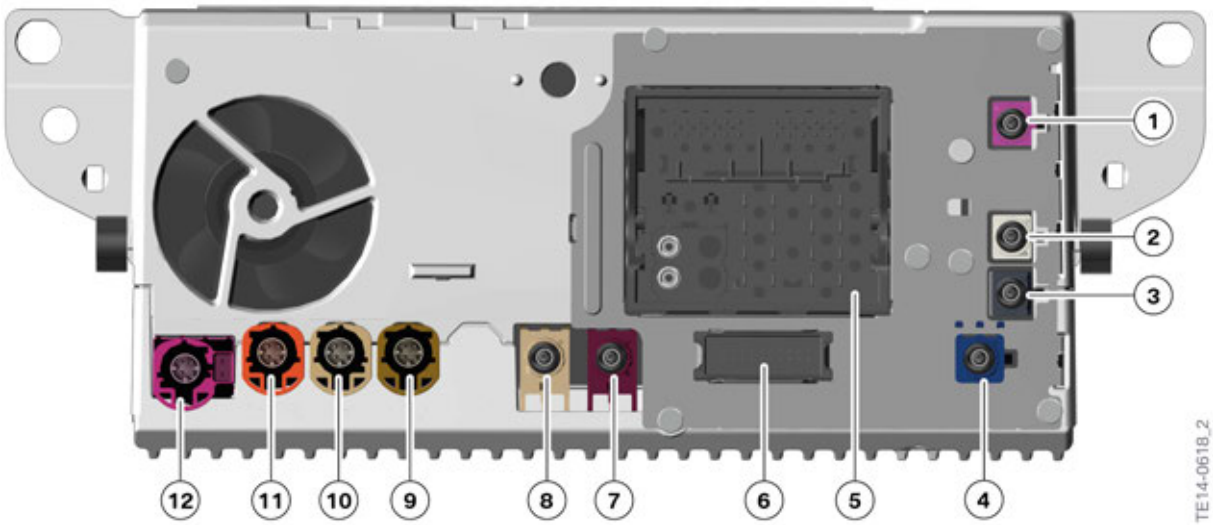


Front view of head unit

Index	Explanation
1	Headunit High 2 with 1.5” housing
2	Headunit High with 2" housing

G12 Audio Systems
3. HU-H2 Hardware

Rear view



Rear view of Headunit High 2

Index	Explanation
1	SDARS in the US version
2	FM2 antenna
3	AM/FM1 antenna
4	GPS antenna connector not used on the G12; the GPS signal is always transmitted to the head unit via OABR Ethernet in the G12
5	Main connector
6	Ethernet connection; connection to the Telematic Communication Box 2 (TCB2)
7	Wi-Fi antenna connection for Wi-Fi®Direct connections
8	Connection for Bluetooth antenna
9	USB2 connection; customer's smartphone via the telephone base plate
10	USB1 connection; customer access to USB audio interface
11	APIX connection to instrument cluster (KOMBI)
12	APIX connection to Central Information Display (CID)

3.1.2. Interior

The Headunit High 2 contains the following components:

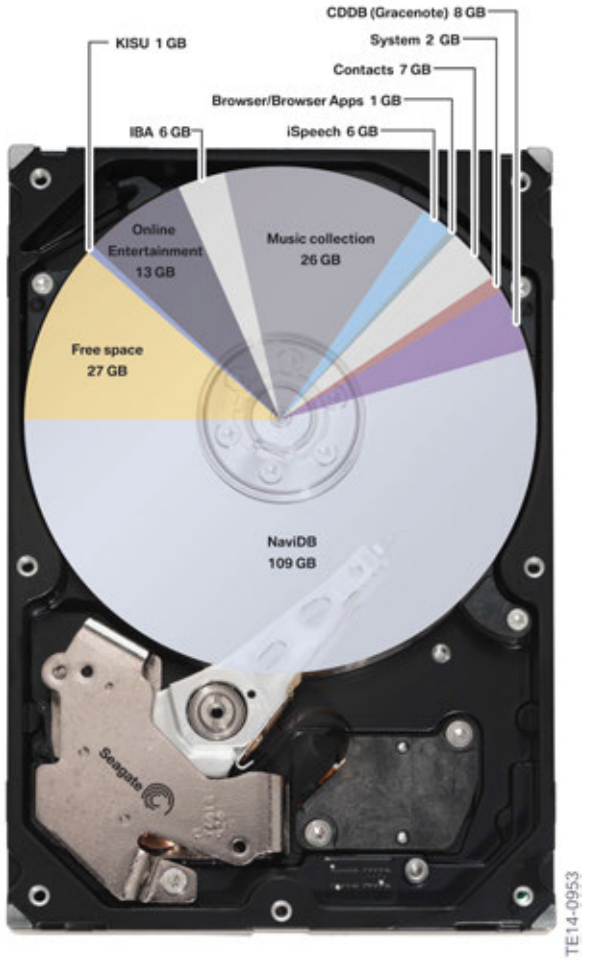
- 1.5" DIN housing (Headunit High was accommodated in a 2” housing).
- Texas Instruments® CPU (processor) with 1.5 GHz and 2 cores.
- 4 GB RAM .

G12 Audio Systems
3. HU-H2 Hardware

- Dirana III® AM/FM tuner for phase diversity (see "G12 Audio systems", Chapter 4.5).
- DVD drive, integrated .
- OABR processor for connection via OABR Ethernet to the new telematic control unit Telematic Communication Box 2 TCB2 as a roof-mounted version (for more information, refer to the "G12 Telephone and telematic systems" training manual).
- Hard disk drive with 200 GB storage capacity with new partitioning.
- SVS system and integrated Touchbox for the controller from Nuance®.

Hard disk partition

In terms of the volume, the hard disk retains the same level of the predecessor head unit with 200 GB. The new division of the hard disk is explained in the next graphic.



G12 Audio Systems
4. HU-H2 Functions

4.1. New operating concept

4.1.1. Introduction

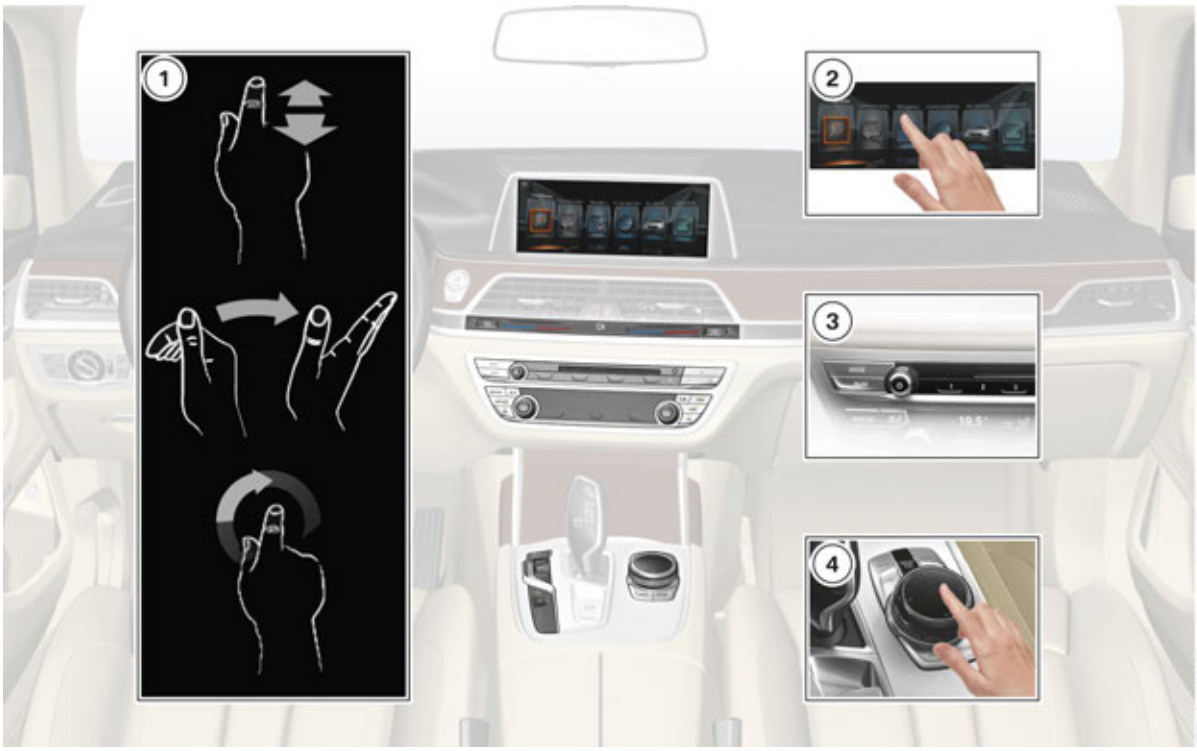
The functions of the new Headunit High 2 correspond to those of the Headunit High with the hardware introduction. However, the improved hardware components (CPU, RAM, graphics card) allow for considerably smoother image structures.

A full description of the individual functions of the Headunit High 2 can be found in the Owner's Manuals of the respective vehicles.

4.1.2. iDrive operating concept ID5++

The iDrive operating concept comprises the following 3 components in the basic equipment: the Central Information Display (CID), the controller CON and the Headunit High 2. The user interface is controlled in the Headunit High 2. The operating concept was completely revamped for the introduction of the G12. It was optimized in order to also permit **touch and gesture control** in addition to control by the iDrive system and operation at the center stack (audio control panel). Touch screen control at the CID is part of the standard equipment; gesture control is linked to selection of optional equipment.

Further detailed information on the topic of touch and gesture control and the associated optional equipment is provided in the "Displays and Controls" training manual.



Operating options in the G12

G12 Audio Systems

4. HU-H2 Functions

Index	Explanation
1	Operation via gesture control (standard equipment in the US market G12)
2	Operation via touch screen on the Central Information Display (CID) (standard equipment)
3	Operation via the audio control panel on the center stack or favorite buttons (standard equipment)
4	Operation via the Touch Controller (standard equipment).

A completely redesigned main menu offers improved clarity in the central information display in the G12.

Main menu overview in the G12

G12 Audio Systems
4. HU-H2 Functions

The **main menu "Media/Radio"**: All media sources of the predecessor head units, i.e. all content of the "old" main menus CD/Multimedia and Radio, was combined here in a large list. The **new main menu Media/Radio was created** from the menus CD/Multimedia and Radio. For the customer, this offers a large number of different options for playing audio files, images, video/film files and apps in the vehicle. In order to maintain clarity, the customer can make the media selection **individually** in a new submenu and thus create his own individual list.

The submenu is called: **Personalize menu**. This submenu "Personalize menu" is not just provided under Media/Radio but also in almost all new main menus so that the user can configure the display lists individually.

The **main menu "Communication"** is a combination of the previous Telephone main menu and previous Office main menu. However, Bluetooth and Wi-Fi pairing is not just possible here, but can now be performed in all menus. This can be selected under the menu option "**Manage mobile devices**".

Messages are displayed here in the main menu Communication and in the newly created menu Notifications. The difference is that the read messages (SMS text messages, e-mails) disappear from the Notifications main menu but remain in the Communication menu.

The content of the **main menu "Navigation"** has also been restructured and contains a host of new features. The touch screen function of the central information display has been adapted, for example. The highlights include the newly designed Micro City Map with a scale of up to 10 m, the learning navigation function, the route magnet and route visualization by means of an antenna view as well as the road book in split screen mode. Further information on this is provided in the "G12 Navigation system" training manual.

The **main menu "ConnectedDrive"** has been kept as a separate menu. The ConnectedDrive services are now no longer "nested" in folders like in the predecessor head units, as was the case for BMW Online, for example. All ConnectedDrive services are now contained in a clear list. This list can also be personalized by means of the "Personalize menu" option. Apps are now started automatically from the iPhone® after they have been accessed once. (The last-accessed app is stored by the system and is activated again when the system is started again). In addition, the apps can now also be connected with the vehicle via a Bluetooth connection alternatively to connection via the USB connection.

The "My Vehicle" menu combines the previous menus Vehicle info and Settings. The settings are divided into vehicle settings and system settings. Further details on this are provided in the "G12 Displays and Controls training manual".

The "Notifications" menu" is a notification center for all message such as e-mails, SMS text messages, Concierge Service and, as a new feature, also Check Control messages. Only new notifications are displayed here that have been sent to the vehicle and not yet read.

A new **"Favorites" menu** can be selected by double-clicking on the direct access key MENU on the controller. The last-selected menu items are then displayed here for selection.

G12 Audio Systems
4. HU-H2 Functions

Favorites menu on the CID

All further information on the operating concept is provided in the "G12 Displays and Controls" training manual.

4.2. Media/Radio

4.2.1. Introduction to radio functions

In the G12, radio reception for FM/AM is offered via the familiar phase diversity system with a tuner in the head unit. The FM/AM system in the G12 is realized in combination with an antenna amplifier and the antennas in the rear window of the vehicle. FM/AM are included in the basic equipment.

4.2.2. FM

FM in the G12

G12 Audio Systems
4. HU-H2 Functions

4.2.3. AM

AM in the G12

4.3. Media/Player functions

4.3.1. History and new perspective

A radio was initially installed in the vehicle exclusively for reception and reproduction of FM/AM signals in the vehicle. This changed with the installation of the first head units in vehicles as from 2002 as everything was now combined in one device. In addition to familiar devices such as a CD/DVD drive and the radio tuners, the navigation system was now also included in the head unit (inbox). Access to the CD/DVD changer was also possible. Information was now displayed in a Central Information Display (CID) and no longer on a small segment display like that used for the radio. With the extension to include external devices in the following years, there were then countless possibilities for audio playback available to the customer.

Customers could now receive, play back, play back "from external source" and stream via Bluetooth audio. A list of all possibilities of playback via an external device available up to now is provided in the "G12 Telephone and telematic systems" training manual. The "G12 Telephone and telematic system" training manual is very well suited for this since ULF-SBX High or Combox were the connectivity interface in the vehicle for a long time. This applies to both USB connection (2007) as well as the first Bluetooth audio streaming (2010) and the first App function (2010).

These functions (both USB from external source as well as Bluetooth audio and Apps) have been integrated in the head unit since 07/12, including the responsible hardware in the form of the Combox multimedia. This means that all connectivity/player functions are now combined in the head unit. In the new G12, the list of options for connection/streaming has even been extended further. This means that a separate training manual would be needed in order to explain all the possibilities in detail.

Another possibility is to change the perspective. Instead of listing all the functions of a device as in the past and thus showing all the possibilities at once, we will now consider the result from the customer's point of view. It is the customer who decides with which medium or function he would like to play back audio, images, video or apps.

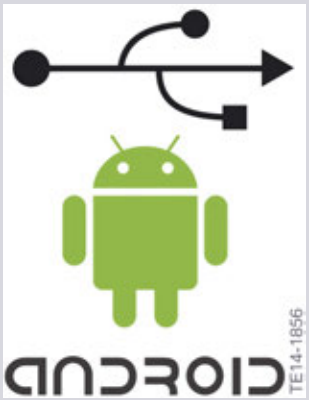
G12 Audio Systems
4. HU-H2 Functions

As a result, the focus is instead on the playback options for **Audio** (music, audio books, etc.), **Images** (customer images, images for media), Film+Video (DVD, video file, etc.) or **Apps** (BMW Connected App or third-party provider). The new user interface (ID5++) of the Headunit High 2 also speaks in favour of this philosophy as it offers the option to hide functions that are not used (chapter Operating concept). This results in the following table**, including the new features** for G12:

AUDIO

G12 Audio Systems

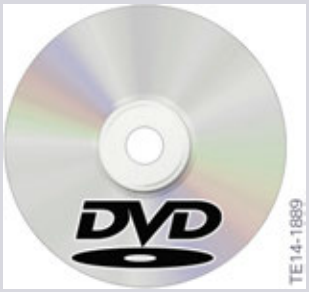
4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	The customer wishes analog playback of music in the vehicle from an **external MP3 player** . In this case, the music data is transferred by means of an analog audio cable with jack plug. **Interface in the G12:** There is an AUX-IN port only in the RSE control unit.	Rear seat entertainment Experience (SA 6FR)
	Music files (MP3, WMA, etc.) for internal audio playback in the head unit; the music data is transferred digitally from the **USB stick** to the head unit and is played back from there. **Interface:** The USB stick is connected to the vehicle via one of the two USB interfaces. With a rear seat entertainment system, the vehicle is also equipped with a USB interface in the rear passenger compartment.	The USB interface in the front center console is standard equipment. There is an additional USB interface in the storage compartment in the center armrest for Convenient telephone (SA 6NS) or Telephone with wireless charging (SA 6NW). USB interface on the RSE control unit with the equipment Rear seat entertainment Experience (SA 6FR)
	**Accessory Mode** Audio playback takes place externally via the **Android®** audio player of the BMW Connected App in the smartphone. **USB mode** Here, the smartphone is connected to the head unit as a storage medium similar to a USB stick. The music files are then transferred from the smartphone (smartphone in MTP mode (= Media Transfer Protocol)) to the head unit via USB. The audio player is the head unit in this case. **Interface:** The mobile phone is connected to the vehicle via the **USB interface** in both modes.	USB interface in the front center console is standard equipment; additional USB interface in the storage compartment in the center armrest for Convenient telephone (SA 6NS) or **Telephone with wireless charging (SA 6NW) for the US market G12.** There is a 3rd USB interface in the vehicle in the RSE control unit for the rear seat entertainment system if the customer has ordered Rear seat entertainment Experience (SA 6FR).

G12 Audio Systems
4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	**Accessory Mode** Audio playback takes place externally via the **Android®** audio player of the BMW Connected App in the smartphone. **USB mode** Here, the smartphone is connected to the head unit as a storage medium similar to a USB stick. The music files are then transferred from the smartphone (smartphone in MTP mode (= Media Transfer Protocol)) to the head unit via USB. The audio player is the head unit in this case. **Interface:** The mobile phone is connected with the base plate of the vehicle via the USB port of the **snap-in adapter** in both modes.	The USB interface in the front base plate is installed in the vehicle ex-works if the customer orders Convenient telephone (SA 6NS).
	Audio playback takes place via the **CD/DVD drive** in the head unit or via the Blu-ray® drive in the RSE control unit in the rear passenger compartment of the vehicle.	The CD/DVD drive is part of the basic equipment of the G12. If the equipment Rear seat entertainment Experience (SA 6FR) is installed, it is also possible to play back CD/DVD media in the RSE control unit and display content on the rear compartment displays.
	Audio playback for Blu-ray® discs is possible exclusively in the Blu-ray® drive in the **RSE control unit** in the rear passenger compartment of the vehicle.	If the equipment Rear seat entertainment Experience (SA 6FR) is installed, playback of Blu-ray® discs in the RSE control unit player is possible in addition to CD/DVD playback.

G12 Audio Systems
4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	**DVD changer**	**No** DVD changer will be offered in the G12.
	Audio playback takes place **externally** via the **iTunes music player** of an **iPod®** or **iPhone®**; the music data is sent to the head unit as digital audio files via USB. **Interface:** The music player or mobile phone is connected to the vehicle via the USB interface. Connection takes place via the original Apple® cable (30-pin or Lightning) or by means of a one-wire cable from the BMW Parts and Accessories range.	USB interface in the front center console is standard equipment; additional USB interface in the storage compartment in the center armrest for Convenient telephone (SA 6NS) or Telephony with wireless charging (SA 6NW). There is a third USB interface in the vehicle in the RSE control unit for the rear seat entertainment system if the customer has ordered Rear seat entertainment Experience (SA 6FR).
	Audio playback takes place **externally** via the **iTunes music player** of an **iPhone®**; the mobile phone is connected with the base plate of the vehicle via the matching snap-in adapter. The music data is sent to the head unit as digital audio files via USB. **Interface:** The USB port in the base plate is used as the interface here. The matching snap-in adapter must also have USB ports (see gold additional contacts on the underside).	The USB interface in the base plate is installed in the vehicle ex-works if the customer orders Convenient telephone (SA 6NS).

G12 Audio Systems

4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	Audio playback takes place via the built-in **hard disk drive HDD** in the head unit. The music was first converted by the head unit with its rip function and stored, or was imported to the hard disk drive from a USB stick or a CD.	The music hard disk is enabled for the customer with 26 GB for the music partition as from Navigation Professional (SA 609) **(standard equipment for the US market G12).**
	**Analog radio Reception** Analog **AM/FM** reception is realized by means of phase diversity with 2 antennas in the rear window in combination with an antenna amplifier. **Processing and output:** There is a digital signal processor in the head unit which calculates an enhanced signal from the two antenna signals using an algorithm. There is also an FM/AM triple tuner in the head unit for further signal processing and audio playback (triple tuner for radio reception, station updates and RDS).	Standard equipment
	**Digital radio Reception:** The SDARS antenna is also in the fin/TCB2 in the US version. **Processing and output:** Processing and output of the received digital radio signals take place in the **SDARS tuner** in the head unit.	Digital Radio (SA 654) or **standard equipment in the US market (for one year) in G12.**

G12 Audio Systems

4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	**Bluetooth audio streaming** Audio playback takes place by means of Bluetooth audio streaming via Audio Video Remote Control Profile (AVRCP 1.3) for Android® devices and Microsoft® devices. In addition, Bluetooth audio also supports the Accessory Protocol IAP for Apple® devices (iPod®, iPhone® etc.). AVRCP 1.4 has been offered in the head units Headunit Basic and Headunit High since 07/13. Since this protocol is implemented very differently by the smartphone manufacturers and this can lead to problems in the vehicle, it was decided not to implement AVRCP 1.4 for the series launch. The series launch will therefore take place with AVRCP 1.3 for the Headunit High. Work is urgently being carried out on developing a solution for stable implementation of AVRCP 1.4. The solution had not yet been decided at the editorial closing date. More information regarding this topic is coming in 2016.	Standard equipment

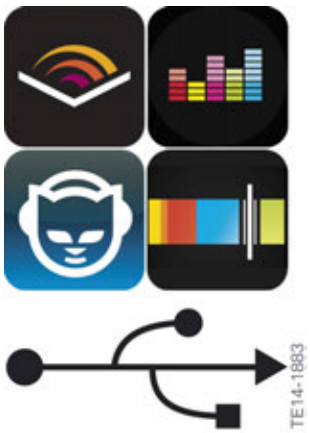
G12 Audio Systems

4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	**Audio streaming via Screencast** Music files on the mobile phone are played back in the music player on the Cell phone and are streamed to the head unit via a Wi-Fi®Direct connection. The display of the mobile phone is mirrored (Desktop Sharing). For this purpose, a Wi-Fi connection must be established between the mobile communication device and the head unit. The function is called Screencast and can be found in the menu Media/Radio.	Convenient telephone (SA 6NS) or **Telephone with wireless charging (SA 6NW standard in the US market G12)**
	**Web radio** **The iPhone® is connected with the head unit via USB**. The BMW Connected App with integrated web radio is started. The data for this is supplied from the internet from the BMW backend. The digital audio files are sent from the mobile phone to the head unit.	Apps (SA 6NR) or **in the package with BMW ConnectedServices (SA 6NK) for the US market G12.** USB interface in the front center console is standard equipment, additional USB interface in the storage compartment in the center armrest for Convenient telephone (SA 6NS) or Telephony with wireless charging (SA 6NW). There is a 3rd USB interface in the vehicle in the RSE control unit for the rear seat entertainment system if the customer has ordered Rear seat entertainment Experience (SA 6FR).

G12 Audio Systems

4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	**Third-party app** Like with web radio (BMW Connected App), **the iPhone® is connected with the head unit via USB** and the respective app of the third party (e.g. Spotify, Deezer, Aupeo etc.) is started. The connection to internet radios or subscription music providers is set up via the customer's mobile phone. The digital audio files are sent from the mobile phone to the head unit.	Apps (SA 6NR) or in the package with BMW ConnectedServices (SA 6NK); USB interface in the front center console is standard equipment, additional USB interface in the storage compartment in the center armrest for Convenient telephone (SA 6NS) or **Telephone with wireless charging (SA 6NW) standard in US market G12.** There is a 3rd USB interface in the vehicle in the RSE control unit for the rear seat entertainment system if the customer has ordered Rear seat entertainment Experience (SA 6FR).

G12 Audio Systems

4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	**Web radio (streamed)** Digital music files are transferred to the head unit via Bluetooth app streaming (a wireless, certified radio link) using the iPhone®. Control is also performed via this Bluetooth wireless link by means of the connection from the head unit to the BMW Connected App on the smartphone.	Apps (SA 6NR) or in the package with BMW ConnectedServices (SA 6NK); USB interface in the front center console is standard equipment, additional USB interface in the storage compartment in the center armrest for Convenient telephone (SA 6NS) or **Telephone with wireless charging (SA 6NW) standard in US market G12.** There is a 3rd USB interface in the vehicle in the RSE control unit for the rear seat entertainment system if the customer has ordered Rear seat entertainment Experience (SA 6FR).
	**Third-party app (streamed)** Digital music files are transferred to the head unit via Bluetooth app streaming (a wireless, certified radio link) using the iPhone® or Android ® mobile phone (currently in planning phase). Control also takes place via this Bluetooth wireless link by means of the connection from the head unit to the individual third-party apps (Spotify, Deezer, Napster, Aupeo, Audible etc.) on the smartphone.	Apps (SA 6NR) or in the package with BMW ConnectedServices (SA 6NK); USB interface in the front center console is standard equipment, additional USB interface in the storage compartment in the center armrest for Convenient telephone (SA 6NS) or **Telephone with wireless charging (SA 6NW) standard in US market G12.** There is a 3rd USB interface in the vehicle in the RSE control unit for the rear seat entertainment system if the customer has ordered Rear seat entertainment Experience (SA 6FR).

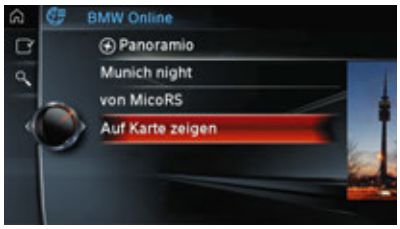
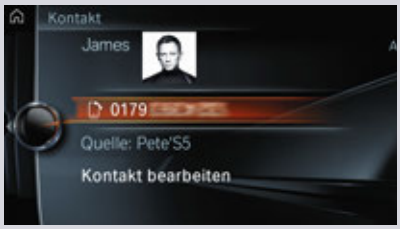
G12 Audio Systems

4. HU-H2 Functions

IMAGES

G12 Audio Systems

4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	**Image streaming via Screencast** Images present on the cell phone are displayed in the gallery on the cell phone and streamed to the head unit via a Wi-Fi®Direct connection. The display of the phone is mirrored (Desktop Sharing). For this purpose, a Wi-Fi connection must be established between the mobile communication device and the head unit. The function is called Screencast and can be found in the menu Media/Radio.	Convenient telephone (SA 6NS) or **Telephone with wireless charging (SA 6NW) standard in US market G12.**
	**Panoramio® images** The BMW ConnectedDrive Services include access to the mobile internet portal BMW Online. In addition to access to weather information, e-mails, messages and a wide range of apps, it is possible to display images/information for the current location or destination from the Google® service Panoramio®.	Panoramio® images have not been implemented in the G12. Instead, a number of country-specific vehicle apps such as "Webcam images" are currently being prepared. Vehicle apps in the ConnectedDrive menu with the optional equipment **ConnectedDrive Services (SA 6AK) (standard for the US market G12).**
	**Contact pictures** Display of contact photos from the address book of the customer's cell phone on the control display. Information on whether this function is supported by the respective cell phone is available at www.bmw.com/update	Convenient telephone (SA 6NS) or **Telephone with wireless charging (SA 6NW) (standard for the US market G12).**

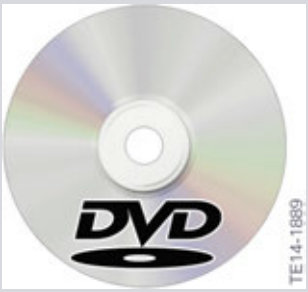
G12 Audio Systems
4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	**Album Covers Gracenote® database** The Gracenote® database stored on the hard disk drive adds missing album covers.	**Navigation system (SA 609) (standard for the US market G12)**
	**Customer album covers** If the customer has already added album covers to the imported music files for the hard disk drive in the individual audio files (MP3, WMA etc.), these have display priority over the album covers of the Gracenote® database. The same applies for audio playback from a USB stick.	**Navigation system (SA 609) (standard for the US market G12)**

FILM + VIDEO

G12 Audio Systems

4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	Video playback via the **CD/ DVD drive** in the head unit HU-H2	Standard equipment
	**Blu-ray® disc** Video playback via the Blu-ray® drive in the RSE control unit.	Rear seat entertainment Experience (SA 6FR)
	**Screencast video streaming** Video files present on the mobile phone are played in the mobile phone player and streamed to the head unit via a Wi-Fi®Direct connection. The display of the mobile phone is mirrored (Desktop Sharing). For this purpose, a Wi-Fi connection must be established between the mobile communication device and the head unit. The function is called Screencast and can be found in the menu Media/Radio	Convenient telephone (SA 6NS) or **Telephone with wireless charging (SA 6NW) (standard for the US market G12)**
	**Digital video HDMI/MHL** Video content is transmitted by cable to the RSE system of the G12 via an HDMI or MHL interface. The content is played back by an external device (smartphone, tablet, games console, etc.). Transmission to the vehicle takes place in digital form. The data is sent to the RSE control unit and displayed on the two rear compartment displays if desired by the customer.	Rear seat entertainment Experience (SA 6FR)

G12 Audio Systems
4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	**Analog video** Video via analog video signal (jack plug). Video content is transmitted by cable to the RSE system of the G12 via an analog video interface. The content is played back by an external device (smartphone, tablet, games console, etc.). Transmission to the vehicle takes place in analog form. The data is sent to the RSE control unit and displayed on the two rear compartment displays if desired by the customer.	Rear seat entertainment Experience (SA 6FR)

G12 Audio Systems

4. HU-H2 Functions

Media source	Function in the vehicle	Required optional equipment
	**Digital video via USB** The stored content of a USB stick is transmitted to the vehicle in digital form. Transmission of the video files to the head unit takes place via the two front USB interfaces. If rear seat entertainment is installed, the customer can additionally use the USB interface on the RSE control unit. The content is then shown on the two rear compartment displays if wished.	Convenient telephone (SA 6NS) or **Telephone with wireless charging (SA 6NW) (standard for the US market G12)** Rear seat entertainment Experience (SA 6FR)
	**Digital video via the smartphone** The stored content of a smartphone is transmitted to the vehicle in digital form in USB mode (transfer similar to a stick). Transmission of the video files to the head unit takes place via the two front USB interfaces. If rear seat entertainment is installed, the customer can additionally use the USB interfaces on the RSE control unit. The content is then shown on the two rear compartment displays if wished.	Convenient telephone (SA 6NS) or **Telephone with wireless charging (SA 6NW) (standard for the US market G12)** Rear seat entertainment Experience (SA 6FR)
	**Video playback by means of a digital video signal via the base plate** The stored content of a smartphone is transmitted to the vehicle in digital form in USB mode (transfer similar to a stick). Transmission of the video files takes place via the USB ports in the front base plate in the vehicle.	Convenient telephone (SA 6NS)

G12 Audio Systems
4. HU-H2 Functions

4.4. Communication

Further details on the topic of communication are provided in the "G12 Telephone and telematic systems" training manual.

4.5. Navigation

4.5.1. Introduction

The navigation system offers a host of new functions. An overview of the new functions is provided in the information bulletin "G12 Navigation system".

Since the navigation software and map data are located **on the hard disk drive** of the head unit, the update procedure for map data will be described in the next chapter of "G12 Audio systems". The reason for this is that the complete description of the Headunit High 2 is also contained in this information bulletin.

Example of navigation in the G12

4.5.2. Overview of map data updating

There are special navigation maps for every head unit for updating map data. The map data is issued in larger markets up to **four times a year** from 2015. In smaller markets once a year. Sometimes, the road maps change by up to 15 % each year. This is why an update makes sense for every customer. In the ASAP portal, a product information bulletin is created for every map release. The bulletin provides detailed information about the respective changes to the predecessor version. The current map data can be ordered by the parts technician via the Electronic Parts Catalogue (EPC):

Head unit	Map data
Car Information Computer (CIC High)	Road Map PREMIUM; update via several DVDs
Car information computer basic 1 (CIC MID)	Road Map MOTION via a USB stick
CIC Basic 2 (Champ2)	Road Map MOVE via a USB stick
HU-B with navigation	Road Map ROUTE via a USB stick
HU-H	Road Map NEXT via a USB stick
HU-H2	**Road Map EVO** (for G12) with own USB stick or streaming

A detailed description on how the map data **Road Map EVO** for the Headunit High 2 is fully (FULL Map update) or partially (Automatic Map update) updated can be found in the next chapter.

In the iDrive Options menu of the navigation, the current version of the installed map data is visible under the menu item "Version of navigation system". Furthermore, in the service acceptance the key data can be read out. The road map currently installed is then displayed.

4.6. Map data updates

4.6.1. Introduction

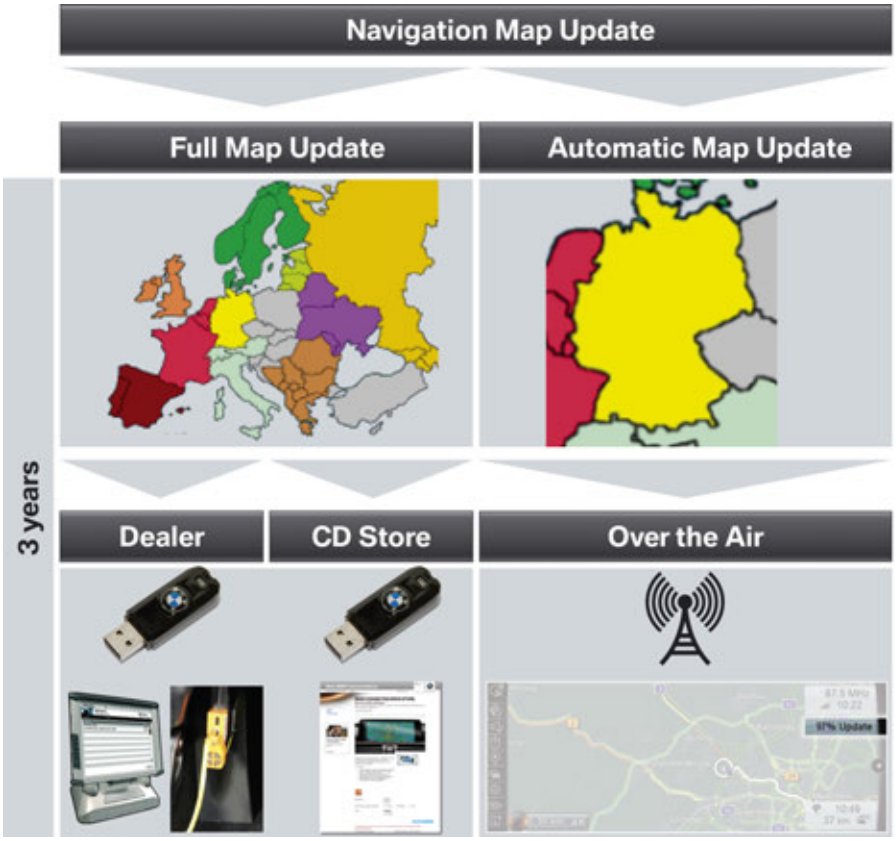
With the introduction of the Headunit High 2, there are now several ways to update the map data of the head unit:

- Update in BMW Service
- Updating by the customer
- Automatic updating

What is new is that with the start of the Headunit High 2 together with Navigation (SA 609), a **3 three-year map subscription** is included.

The map data is updated here up to four times per year, whereby a distinction is made between a **Full Map update** (update of the complete map data on the hard disk drive) and the **automatic map update**. The Full Map update (for e.g. Europe) can be carried out in the conventional way using a USB stick or via the BMW programming system. The difference is that the data must be uploaded onto the USB stick (up to 2019).

The automatic map update takes place by means of the SIM card installed in the vehicle only for the respective home region (e.g. Germany). The automatic map update function is planned for the markets DE, ES, FR, IT, NL, GB, US, CA and CN.



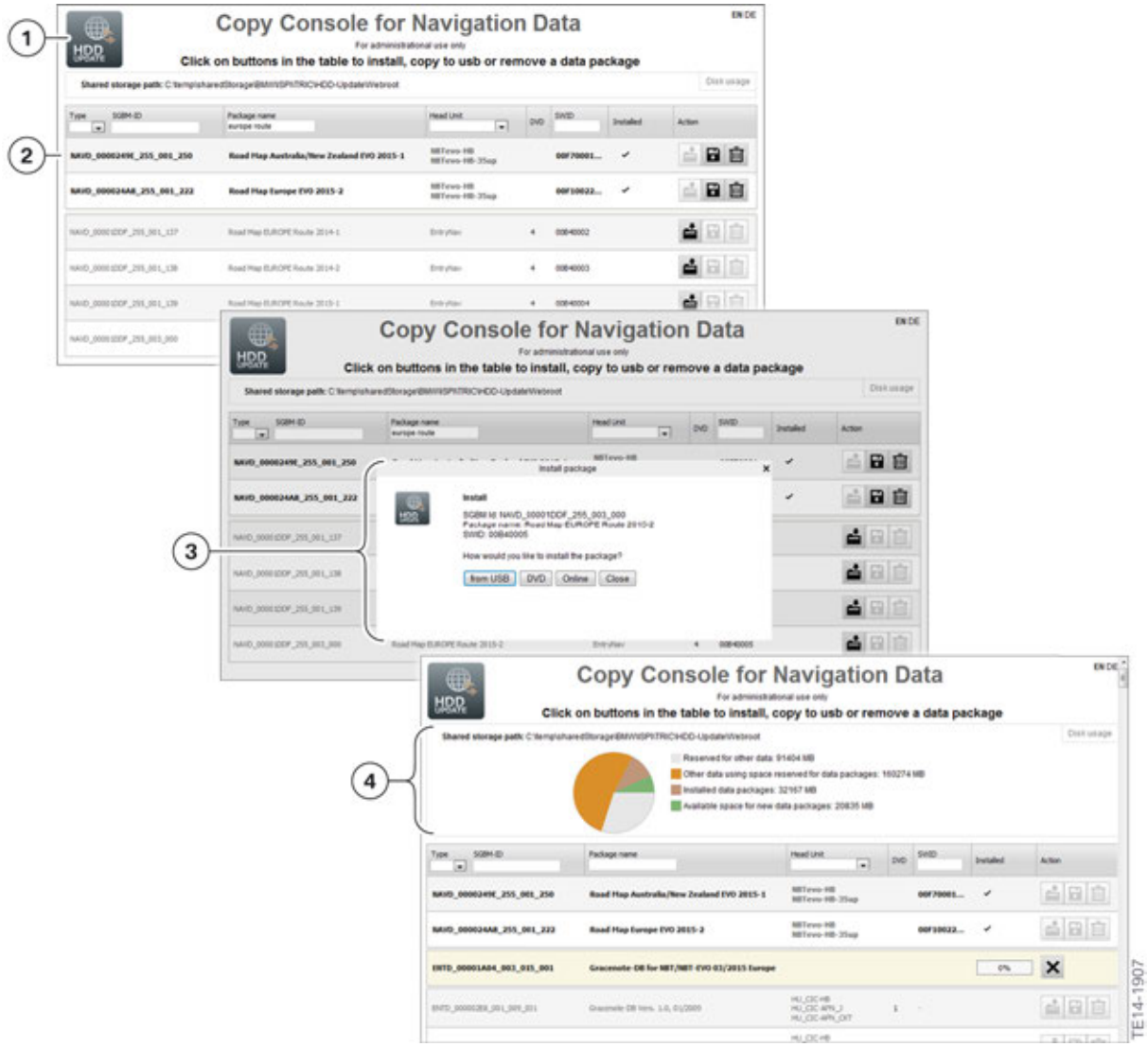
Comparison of Full Map update vs. automatic update

4.6.2. Updating by the workshop

Updating the map data remains unchanged for BMW Service. BMW Service can load the map data either via the USB interface or via the BMW diagnosis/programming system.

Transfer of the map data via the USB interface in the vehicle is performed using a USB stick onto which the service technician has copied the map data himself. The data is copied to the USB stick from a workshop PC via a copy web console.

G12 Audio Systems
4. HU-H2 Functions



Copy console

Index	Explanation
1	Copy console for the HDD update (hard disk drive map data) of the ISPI-Admin-Toolset
2	Already available map on the shared storage (NAS server) of the service workshop
3	Installation (download) of new, additional map data onto the shared storage
4	Overview table of storage capacity on the shared storage

The map data is not invoiced to the customer (three-year map subscription). However, the working time required for the programming/updating is charged.

4.6.3. Updating by the customer

The customer can update his map data himself.

Alternatives for the customer

- Data transfer via the vehicle's USB interface using a self-created USB stick (Full Map update) in conjunction with the **ConnectedDrive Portal/Store**. There will be complete map data packages on a quarterly basis which will be made available to the customer for download via the ConnectedDrive portal.
- Data transfer via the vehicle's USB interface by means of the **USB stick** (Full Map updates, map data EVO) available from BMW Parts probably as from **2019**. Alternatively, the customer can have the current map data transferred to the vehicle by BMW Service subject to payment of the working time (Chapter 4.7.1).

ConnectedDrive Portal/Store

The ConnectedDrive Store has been offered in combination with the ConnectedDrive portal since the end of 2014.

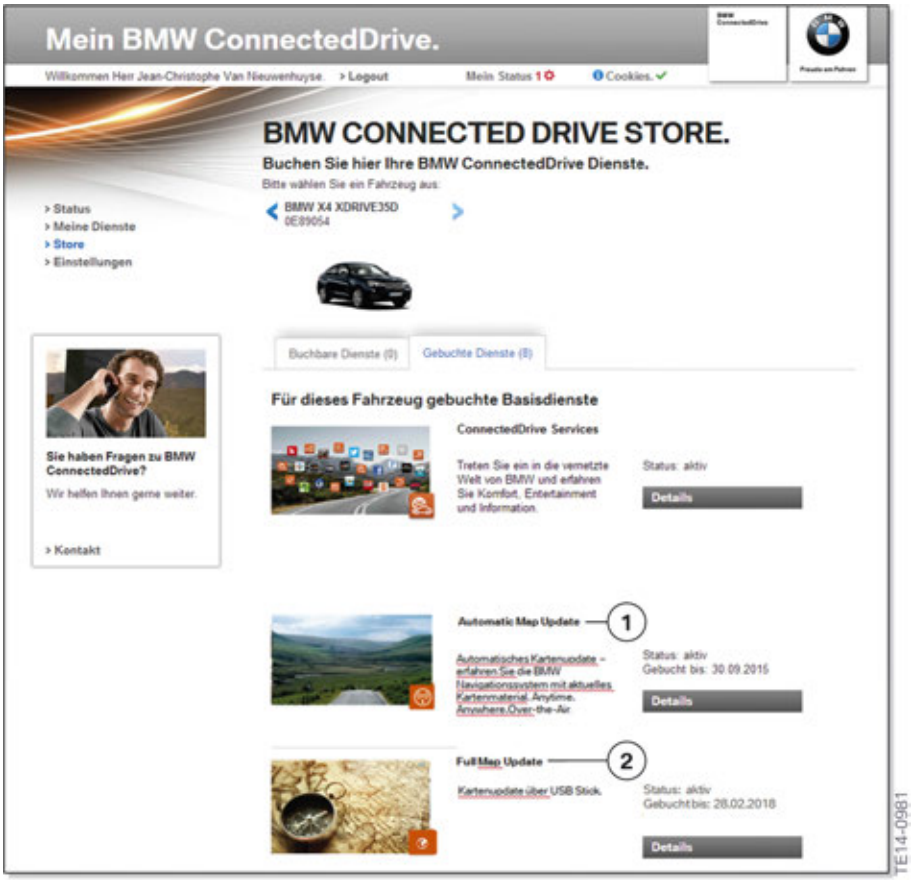
https://www.bmw-connecteddrive.com

A prerequisite for this is that the vehicle is "mapped". In other words, the vehicle is assigned to the customer's ConnectedDrive account. Successful mapping is visible in the header with the currently displayed customer vehicle and the correct VIN.

In this ConnectedDrive store, basic and individual services can be called up using the "Ordered services" button. As from the middle of 2015, the map update function will be visible in the submenu Basic services.

The menu options "Automatic map update" and "Manual map update" (Full Map update) will then be available.

G12 Audio Systems
4. HU-H2 Functions

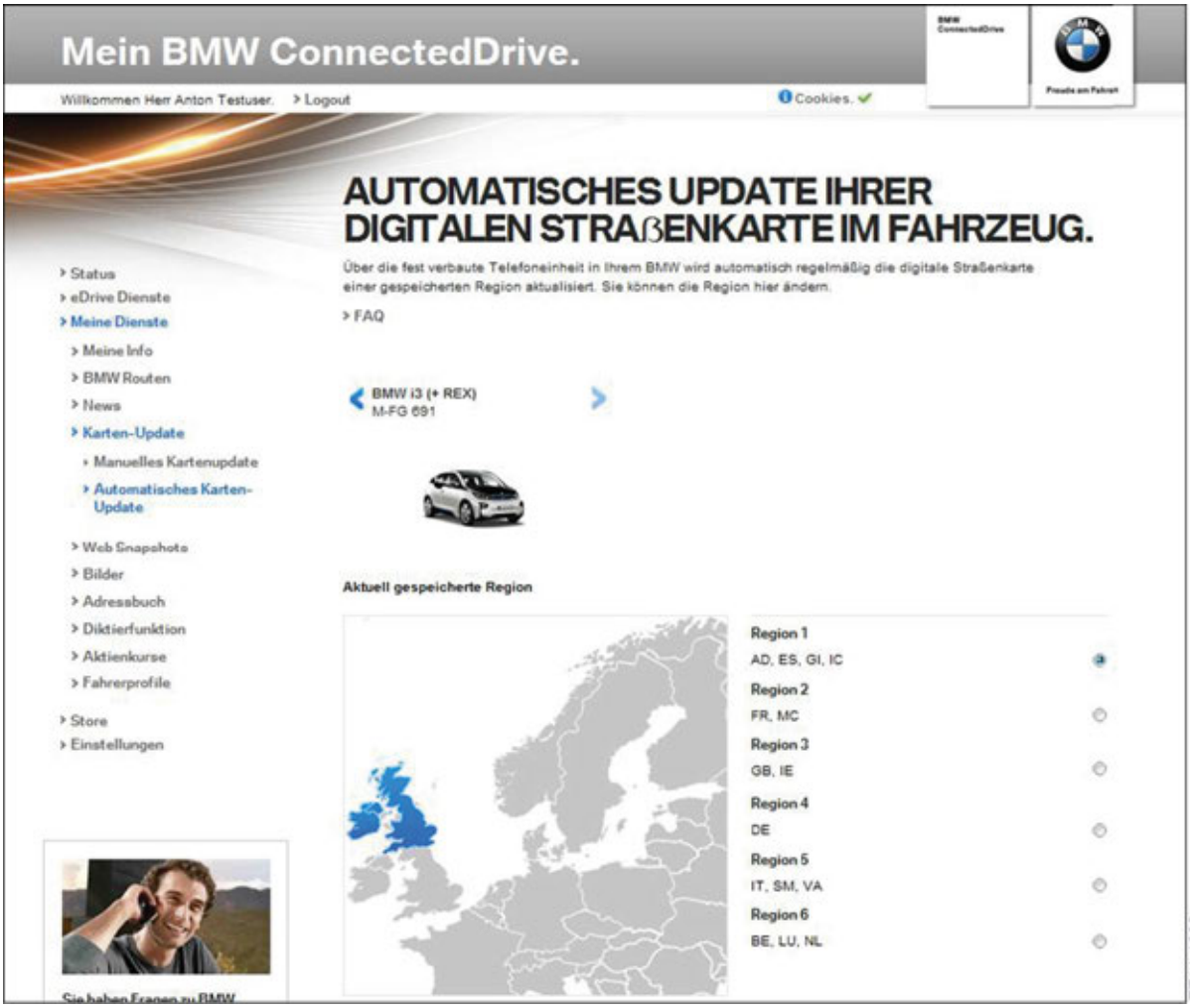


Store in ConnectedDrive portal

Index	Explanation
1	Automatic map update
2	Manual map update

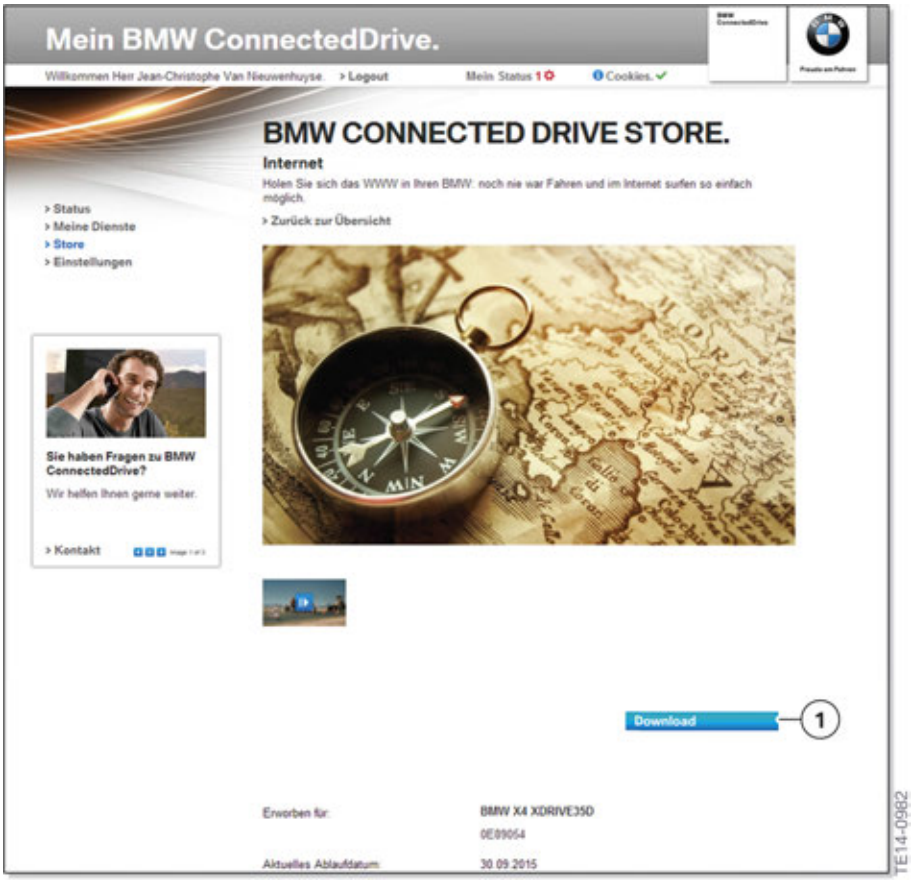
In the "Automatic map update" area, it is possible to display the **region** for the respective map update and change this if necessary if the customer moves.

G12 Audio Systems
4. HU-H2 Functions



Automatic map update

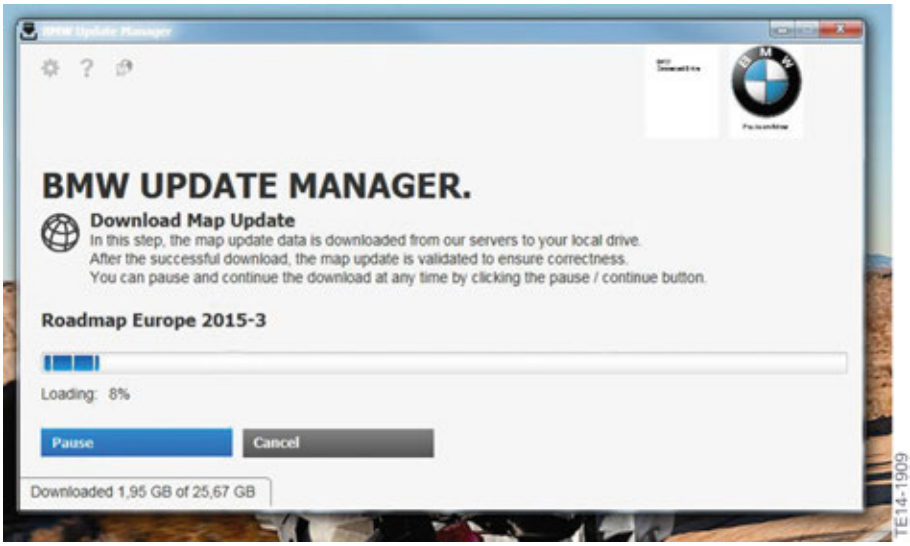
An installation menu can be opened by means of a download button in the "Manual map update" area.



Download area in the store

Index	Explanation
1	Download installation program "BMW UPDATE MANAGER"

In the next step, the map data is loaded and saved on the PC by means of the "BMW UPDATE MANAGER" installation program. From here, the customer can copy the map data onto a USB stick and load it in the vehicle.



BMW UPDATE MANAGER

Parts Service

From 2019, the first map data updates for the Headunit High 2 (map data EVO) will be available for the customer via a USB stick available in BMW Parts. The first 3-year map subscriptions will expire in the middle of 2018.

Map data updating via the USB interface

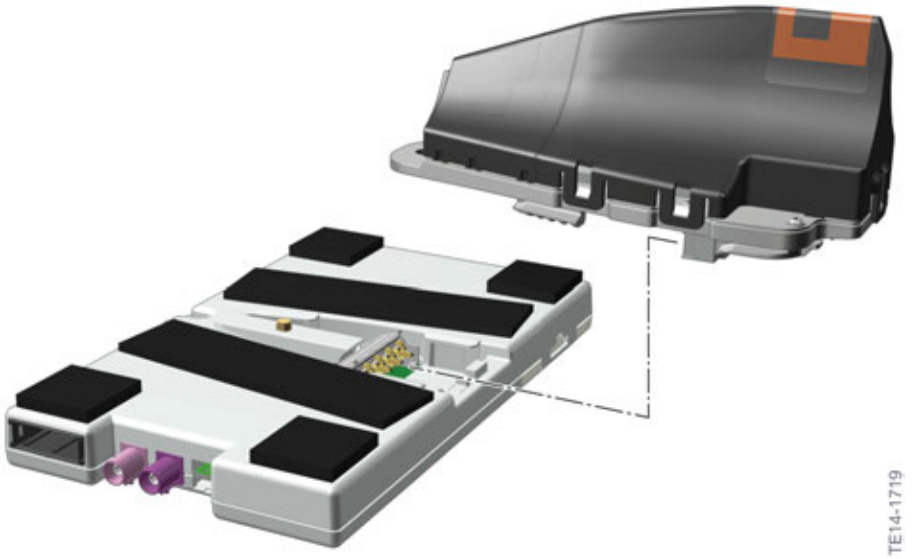
Index	Explanation
1	Customer buys the USB stick in BMW Service (from 2019)
2	USB stick with current map data
3	Customer loads the map data using a USB stick and enabling code via the USB interface to the vehicle

4.6.4. Automatic updating

Partial update

An "automatic update" takes place via data streaming with an incremental map data update, without the customer having to initiate anything. Incremental means that only a certain part of the map is updated.

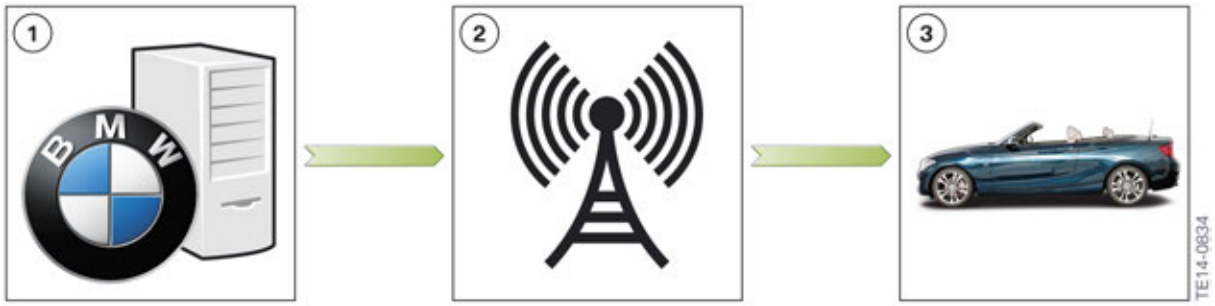
A prerequisite for this is an online connection via an **active SIM card** in the vehicle. The hardware of the SIM card is located in Telematic Communication Box 2 TCB2. You can find details on the TCB2 in the "G12 Telephone and telematic systems" training manual.



TCB2 roof-mounted version in the G12

With an activated SIM card, the ConnectedDrive Services become active with the customer's signature on the "Get Connected" form after activation by BMW AG.

The automatic update is effected without intervention from the customer, i.e. the customer does **not** have to start the update process manually.



Automatic map data updating

Index	Explanation
1	BMW server with the current map data
2	Updated map data (only some areas of the map) are transmitted online to the customer's vehicle and added to the navigation map data there.
3	Customer's vehicle with current valid ConnectedDrive contract

With an automatic update, using the example of a European map, the complete data is not updated (about 30 GB); instead, only the current changes for each update field (max. 350 MB) are updated.

G12 Audio Systems
4. HU-H2 Functions

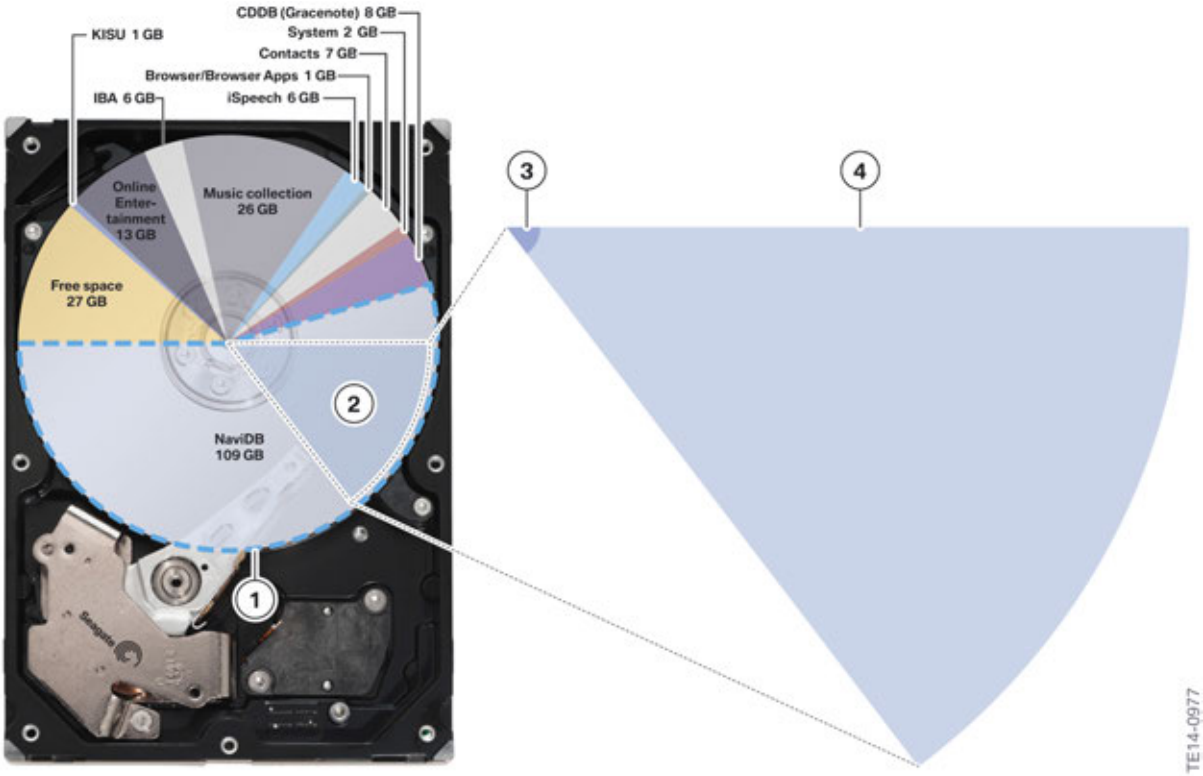
There will be only one update region for **Germany**. No matter whether the customer lives in the north, south, east, west or middle of Germany, **only** the entire map of Germany will be updated with the automatic update. The rest of the European map on the head unit is not affected by the automatic update. For customers living in the neighboring regions, a full map update of the entire map of Europe is also offered.

In **Europe**, it is planned to have a common automatic update for customers in Austria, Switzerland, Liechtenstein, Hungary, Slovenia and Croatia, for example. An individual solution will therefore be offered for each country or region in Europe.

There are also these individual solutions for the automatic update in **North America**. At the moment, approximately 11 states/regions in the US are planned for the automatic update. Among others, a region with the New England states and one with Canada and Alaska.

The exact division of which countries/regions are summarized in automatic update regions was not known at the time of the editorial deadline.

Map data on the hard disk

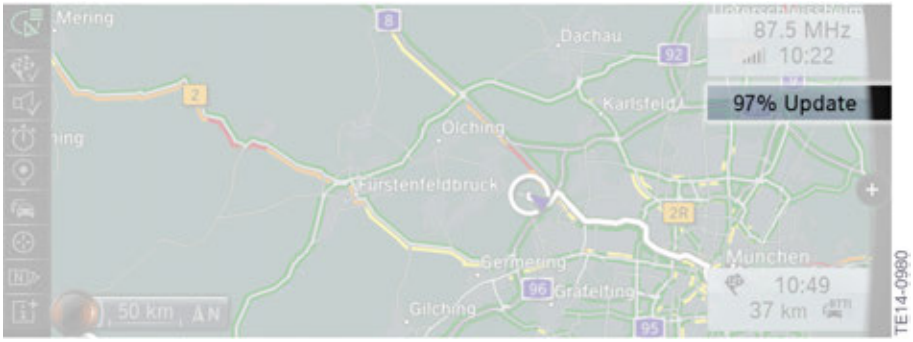


Partitioning of the hard disk of the Headunit High 2

Index	Explanation
1	Section of the partition (109 GB)
2	Map data for Europe; for example filled with about 30 GB
3	Streaming updates max. 350 MB every three months via "Automatic Map update"; according to the state, region of the customer
4	Remaining map of Europe = (29.5 GB) which is **not** automatically updated

Display in the vehicle

The map data is updated regularly and several times a year (up to four times), as soon as an updated map version is available. The progress of the update can be read on the central information display.



Example of automatic map updating

The minimum requirement for automatic updating is that terminal 15 is active.

If the updating is cancelled (for e.g. no data connection or end of the journey), the updating is continued as soon as terminal 15 is active again and the vehicle has re-established a data connection to the BMW server.

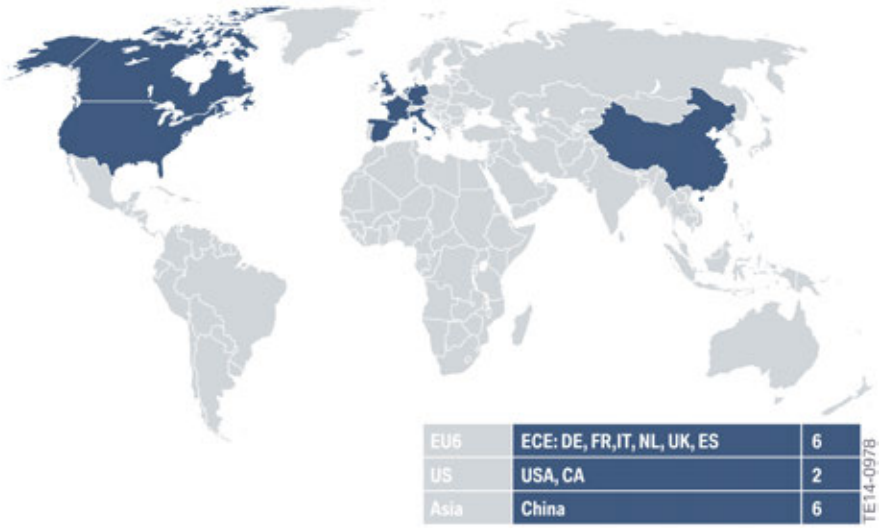
4.6.5. Loading the enabling code

The repair or initial enabling code FSC is still available in the ASAP portal. However, the length of the repair code or initial enabling code will change. Instead of 21 characters, an over 100-character code will now be required. However, a new process allows this to be accessed on the ASAP portal, saved on a USB stick and loaded into the head unit. FSC input via the BMW diagnosis system or BMW programming system is still possible.

G12 Audio Systems
4. HU-H2 Functions

4.6.6. Availability

Where is automatic updating possible from 2015?



Availability of automatic update

- Germany
- United Kingdom
- Italy
- France
- Netherlands
- Spain
- US
- Canada
- China

G12 Audio Systems

4. HU-H2 Functions

For which markets is introduction of the Full Map update planned?

Available markets for introduction of Full Map update

G12 Audio Systems

5. Speakers and Amplifiers

5.1. Overview

Two hi-fi systems are offered in the G12. Each of the Two systems has a hi-amplifier which is specifically adapted for each system. The Top HiFi system is the Harman Kardon Surround Sound System (SA 688) is offered as the standard system. For the first time at BMW, a High End system is offered in cooperation with Bowers & Wilkins. The High End system Bowers & Wilkins Diamond Surround Sound System (SA 6F1). A comparison of the individual hi-fi systems is provided below:

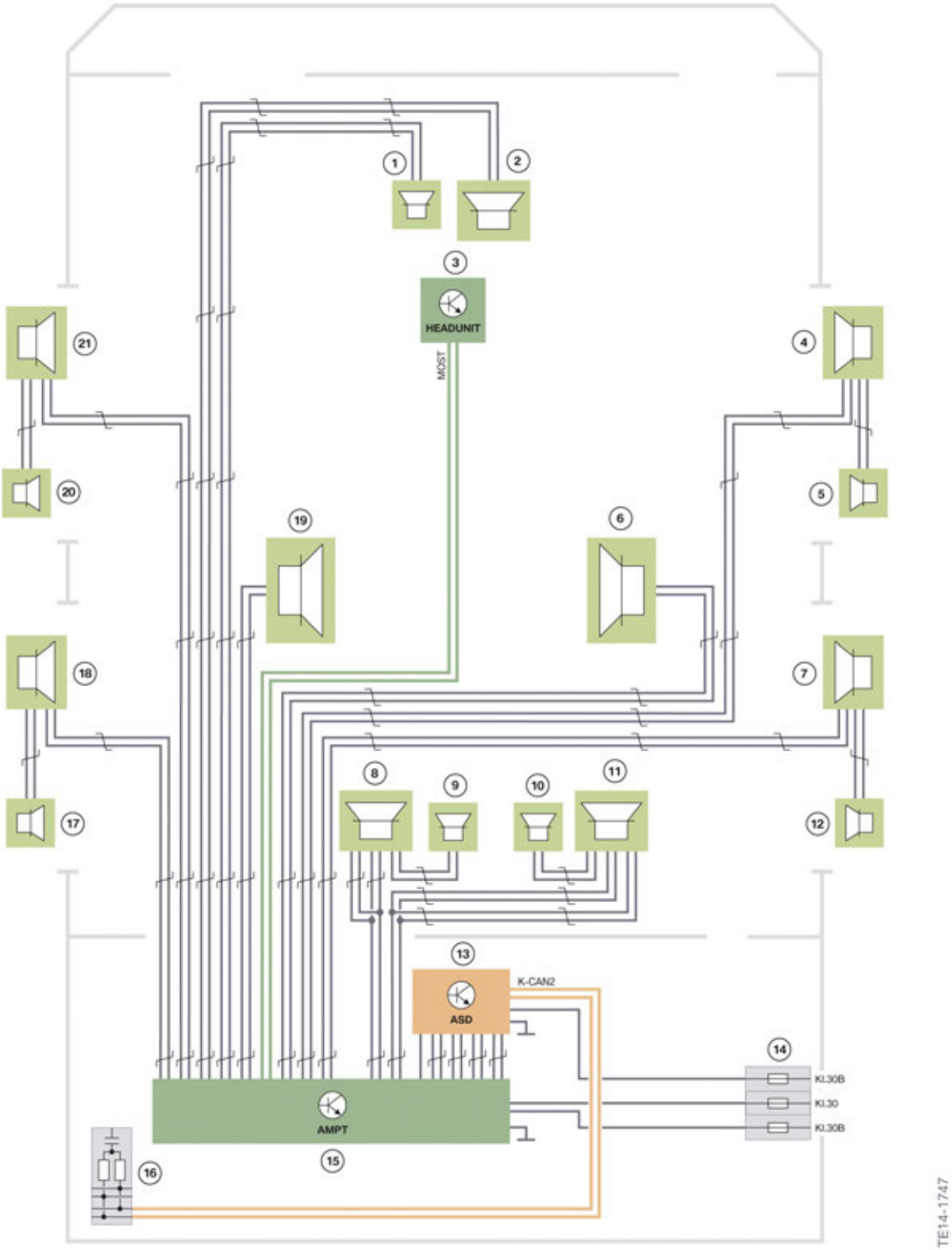
System	SA	Channels/ power/ speakers	Tweeters	Mid-range speakers	Bass speakers
Top HiFi	688	9/600W/16	7	7	2
High End	6F1	10/1200W/1	7	7	2

5.2. Top HiFi system

The Top HiFi system is branded with speaker covers with the logo “harman/kardon”. It comprises 16 speakers.

G12 Audio Systems

5. Speakers and Amplifiers



System wiring diagram, Top HiFi system

G12 Audio Systems

5. Speakers and Amplifiers

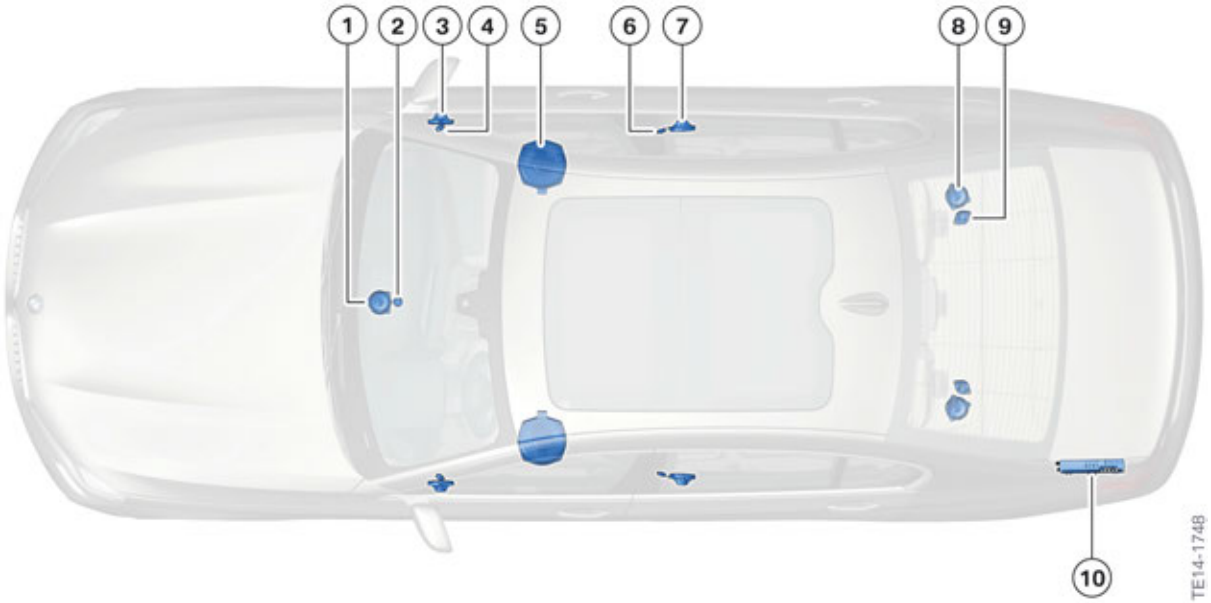
Index	Explanation
1	Center tweeter in the instrument panel
2	Center mid-range speaker in the instrument panel
3	Head unit
4	Mid-range speaker in the front right door trim panel
5	Tweeter in the front right mirror triangle
6	Bass speaker “central bass” at front right under the front passenger seat
7	Mid-range speaker in the rear right door trim panel
8	Mid-range speaker in storage shelf, rear left
9	Tweeter in storage shelf, rear left
10	Tweeter in storage shelf, rear right
11	Mid-range speaker in storage shelf, rear right
12	Tweeter in the rear right door trim panel
13	Active Sound Design (ASD)
14	Power distribution box, rear
15	Amplifier Top (AMPT) (amplifier of the Top HiFi system)
16	K-CAN terminator
17	Tweeter in the rear left door trim panel
18	Mid-range speaker in the rear left door trim panel
19	Bass speaker “central bass” at front left under the driver's seat
20	Tweeter in the front left door trim panel
21	Mid-range speaker in the front left door trim panel

G12 Audio Systems

5. Speakers and Amplifiers

5.2.1. Top HiFi system components

Speakers



Top HiFi system in the G12

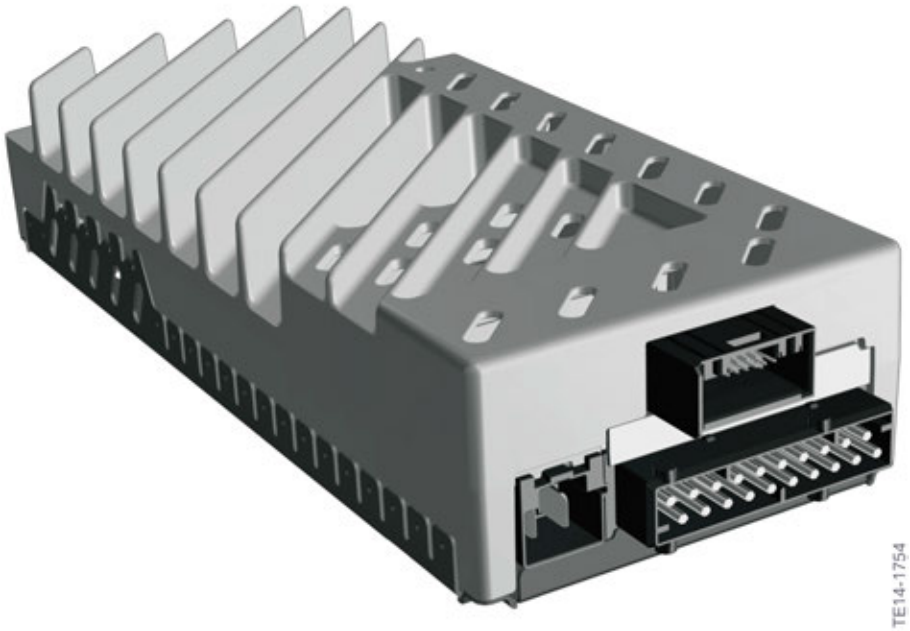
Index	Explanation
1	Center mid-range speaker in the instrument panel
2	Center tweeter in the instrument panel
3	Mid-range speaker in the front right door trim panel
4	Tweeter in the front right mirror triangle
5	Bass speaker “central bass” at front right under the front passenger seat
6	Tweeter in the rear right door trim panel
7	Mid-range speaker in the rear right door trim panel
8	Mid-range speaker in storage shelf, rear left
9	Tweeter in storage shelf, rear left
10	Top HiFi amplifier

G12 Audio Systems

5. Speakers and Amplifiers

Amplifier

Equalizing can be individually adjusted on the amplifier (AMPT) of the Top HiFi system. The equalizer is an electronic filter for sound design. It is used for manual adjustment of frequency ranges and for compensation of linear distortion in sound signals. The Top HiFi amplifier of the G12 has an output power of 600 W and is connected with the vehicle electrical system and the head unit via the MOST bus.



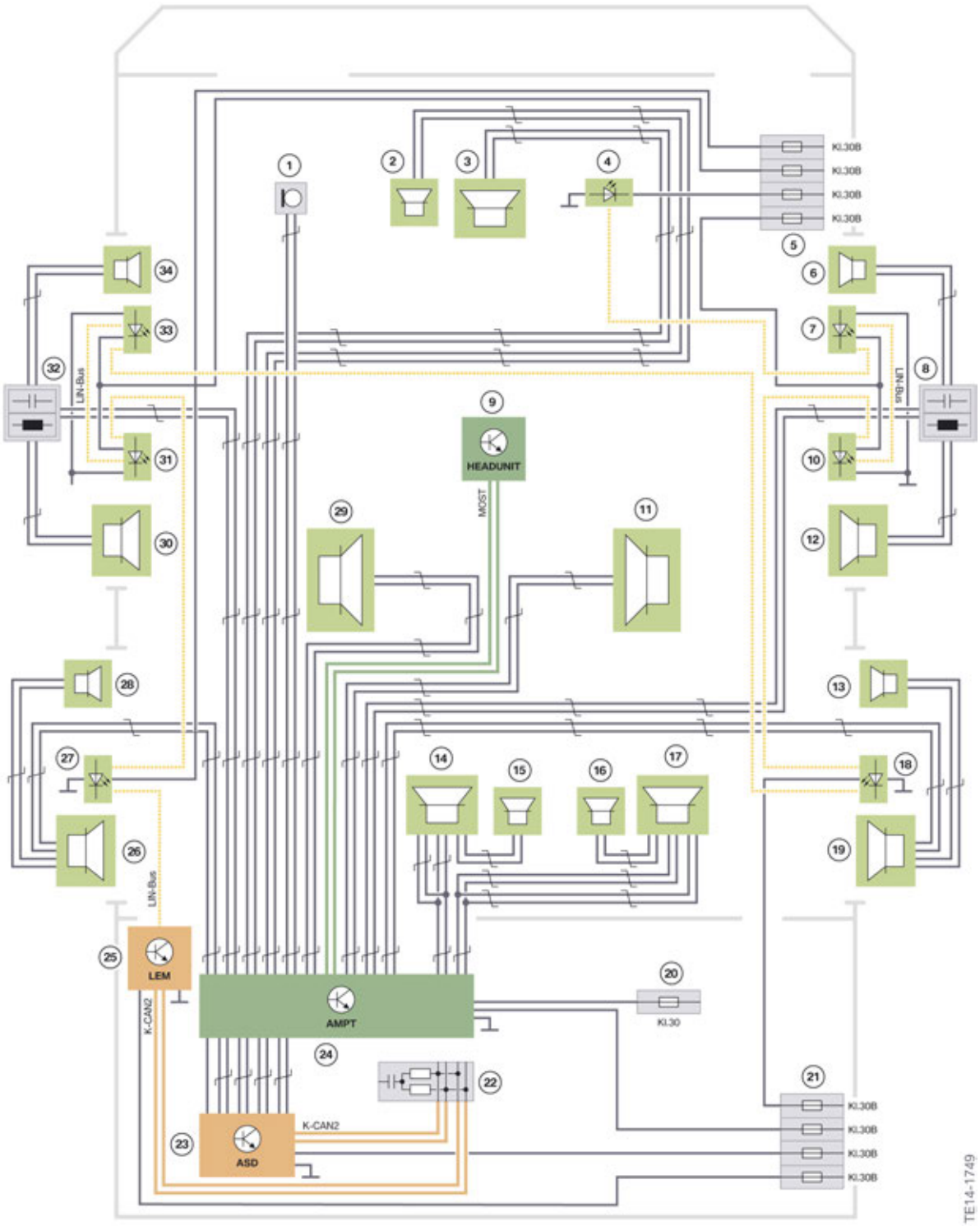
Top HiFi amplifier of the G12

G12 Audio Systems

5. Speakers and Amplifiers

5.3. High End system

5.3.1. System overview



System wiring diagram of High End system in the G12

G12 Audio Systems
5. Speakers and Amplifiers

Index	Explanation
1	Microphone volume adjustment
2	Center tweeter in the instrument panel
3	Center mid-range speaker in the instrument panel
4	Center speaker LED
5	Power distribution box, front
6	Tweeter in the front right mirror triangle
7	Right mirror triangle LED
8	Analog frequency diplexer, front right door
9	Headunit High 2
10	Speaker cover LED, front right
11	Bass speaker “central bass” at front right under the front passenger seat
12	Mid-range speaker in the front right door trim panel
13	Tweeter in the rear right door trim panel
14	Mid-range speaker in storage shelf, rear left
15	Tweeter in storage shelf, rear left
16	Tweeter in storage shelf, rear right
17	Mid-range speaker in storage shelf, rear right
18	Speaker cover LED, rear right
19	Mid-range speaker in the rear right door trim panel
20	Power distribution box, battery, rear right
21	Power distribution box, rear
22	K-CAN terminator
23	Active Sound Design (ASD)
24	Amplifier Top (AMPT) (amplifier of the Top HiFi system)
25	Light Effect Manager
26	Mid-range speaker in the rear left door trim panel
27	Speaker cover LED, rear left
28	Tweeter in the rear left door trim panel
29	Bass speaker “central bass” at front left under the driver's seat
30	Mid-range speaker in the front left door trim panel
31	Speaker cover LED, front left
32	Analog frequency diplexer, front left door
33	Left mirror triangle LED
34	Tweeter in the front left mirror triangle

G12 Audio Systems
5. Speakers and Amplifiers

5.3.2. Bowers & Wilkens

Bowers & Wilkins (B&W) is a company that was founded by John Bowers and Roy Wilkins in England in 1996 under the name B&W Electronics. The company mainly develops and manufactures speakers in the mid and high price segment that are used in homes as well as studios.

Since 2008, Bowers & Wilkins has also served the computer and wireless segment with its New Media series. The most well-known product in this series is the Bowers & Wilkins Zeppelin, which received the EISA Award 2008–2009 as "Best Product" in the sound station segment.

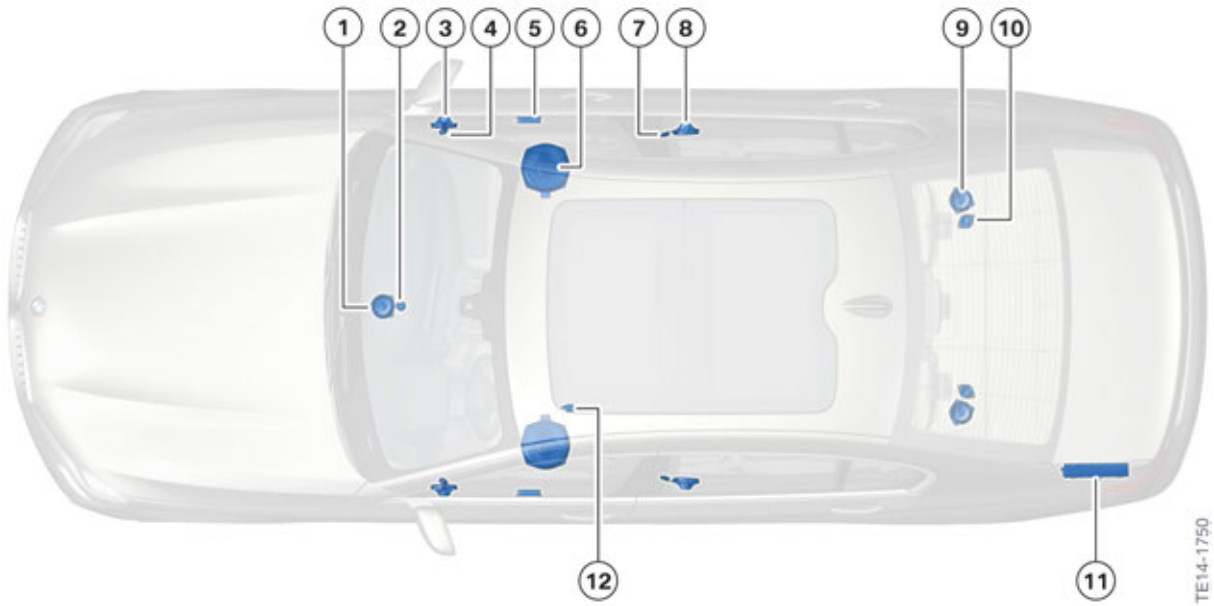
The most well-known speaker from the company is the Nautilus from 1993. The housing in the form of a snail shell accommodates a 4-way system with separate active crossover system. The speaker is the first to use the so-called Nautilus tube technology, where the sound radiated by the speaker to the rear of the housing is absorbed by the reverse-tapered horn geometry. This avoids superposition of noise produced in the housing and drivers on the music signal. In the 800 Diamond series introduced in 2010, all speakers are equipped with tweeters made of industrial diamonds.

"Bowers & Wilkins" logo and the Nautilus active speaker system

The cooperation between BMW and Bowers & Wilkins now starts with the G12. The customer can order the optional equipment High End System Bowers & Wilkins Diamond Surround Sound System (SA 6F1). A component overview in the bird's eye view of the G12 is provided below.

G12 Audio Systems

5. Speakers and Amplifiers



High End hi-fi system in the G12

Index	Explanation
1	Center mid-range speaker in the instrument panel
2	Center tweeter in the instrument panel
3	Mid-range speaker in the front right door trim panel
4	Tweeter in the front right mirror triangle
5	Analog frequency diplexer, front right door
6	Bass speaker “central bass” at front right under the front passenger seat
7	Tweeter in the rear left door trim panel
8	Mid-range speaker in the rear right door trim panel
9	Tweeter in storage shelf, rear right
10	Tweeter in storage shelf, rear right
11	High End amplifier (AMPT)
12	Microphone volume adjustment

The Bowers & Wilkins Diamond Surround Sound System differs **visually** from conventional audio systems through 2 center speakers in the instrument panel with illuminated Bowers & Wilkens logo.

All B&W speakers in the vehicle are protected by special stainless steel perforated covers. **The light staging** in the vehicle is created by the LED-illuminated speakers, which create a three-dimensional effect by means of the special hole pattern in the stainless steel covers.

G12 Audio Systems

5. Speakers and Amplifiers

Light staging with the Bowers & Wilkins Diamond Surround Sound System

In contrast to the predecessor High End system, the light staging is not controlled by the High End amplifier but by the Light Effect Manager (LEM) control unit used for the first time by BMW.

The Bowers & Wilkins Diamond Surround Sound System impresses **acoustically** with optimized sound playback to all seats for stereo and multi-channel audio formats.

It is possible to choose between 5 **sound profiles** developed by the Swedish company Dirac®.

G12 Audio Systems
5. Speakers and Amplifiers

Overview of sound profiles of the Bowers & Wilkins Diamond Surround Sound System

Studio: In Studio mode a frequency and phase correction of the speakers takes place. In this the signal is modified in both time and in the frequency range in order to compensate for various time delays and sound reflections in the vehicle depending on seating position. This leads to a linear and correctly timed playback in the passenger compartment. Through the signal fidelity formed in this way an exceptionally diverse and lively sound experience is created for all occupants. An undistorted impression is created as if you were present at the original recording in the sound studio.

Concert: The Concert mode ensures an open and lively spatial effect through special sound field modulation in the passenger compartment. This inspires the illusion that the speakers have been replaced by virtual speakers and have been moved outwards. It is similar to a music experience in a large concert hall.

G12 Audio Systems

5. Speakers and Amplifiers

On Stage: Here, the Concert mode is modified to create the impression of being on stage among the musicians instead of in the concert hall.

Cinema: The G12 is equipped with a DVD player in the head unit and a Blu-Ray player in the rear seat entertainment system. It is additionally possible to stream films from a USB stick or an Android® cell phone. The Cinema mode is optimized for this film playback mode. The Cinema mode creates a sound distribution with special Surround Sound like in the cinema.

Lounge: This mode is specially designed for rear passenger compartment occupants. The sound of the entire vehicle is optimally tailored to the rear seats.

G12 Audio Systems

5. Speakers and Amplifiers

5.3.3. Speakers of the High End system

All speakers (tweeters, mid-range and bass speakers) are connected directly to the audio amplifier or via an analog frequency diplexer. The speaker highlights of the High End system are shown below:

Speakers of the Bowers & Wilkins Diamond Surround Sound System

Index	Explanation
1	Diamond tweeter
2	Opened diamond tweeter with Nautilus™ spiral technology
3	Mid-range speaker with Kevlar® diaphragm
4	Top view of “central bass” bass speaker
5	Bottom view of “central bass” bass speaker

G12 Audio Systems

5. Speakers and Amplifiers

The **tweeters** in the front area (center or right and left in the mirror triangle) of the vehicle are equipped with tweeters made of industrial diamond. The extreme hardness of the diamond coating ensures extreme pulse fidelity and linearity even in the highest frequency ranges. The Nautilus™ spiral technology is used for the tweeters. Sound waves radiated to the rear of the housing are absorbed by the horn channels at the rear of the tweeter.

The tweeters in the rear doors and storage shelf have high-quality aluminium diaphragms.

The **mid-range speakers** are accommodated in an almost vibration-free die-cast aluminium housing and are equipped with a very high-quality neodymium magnet with the highest field strength values. The diaphragm is made of Kevlar®, a very light and extremely strong plastic fiber made of synthetic aramid fibers (man-made performance fibers).

The **bass speakers** are installed under the front seats as central bass speakers. The diaphragms made of Rohacell® foam are produced with several sandwich layers. This makes the diaphragm extremely rigid, which benefits sound output in the low frequency ranges. The neodymium magnets are also used for the bass speakers.

Analog frequency diplexers are installed in the front doors of the G12 in combination with the Bowers & Wilkins Diamond Surround Sound System. These separate the high and mid-range frequencies more precisely and with a better sound result than is possible using a single capacitor mounted on the speaker.

Discrete (with individual components) high- and low-pass filter in the analog frequency diplexer

G12 Audio Systems

5. Speakers and Amplifiers

5.3.4. High End amplifier (AMPT)

The high-end audio amplifier is a control unit in the MOST network. It is a Class D amplifier with 1200 W output power.

The Class D audio output stages of the High End audio amplifier have a significantly higher efficiency than conventional Class A, B, or AB amplifiers. The power losses compared with conventional audio output stages are minimized by pulse width modulation and switched-mode transistors. A continuous voltage characteristic corresponding to the input signal is generated by a low-pass filter after the power stage.

High End amplifier (AMPT)

G12 Audio Systems

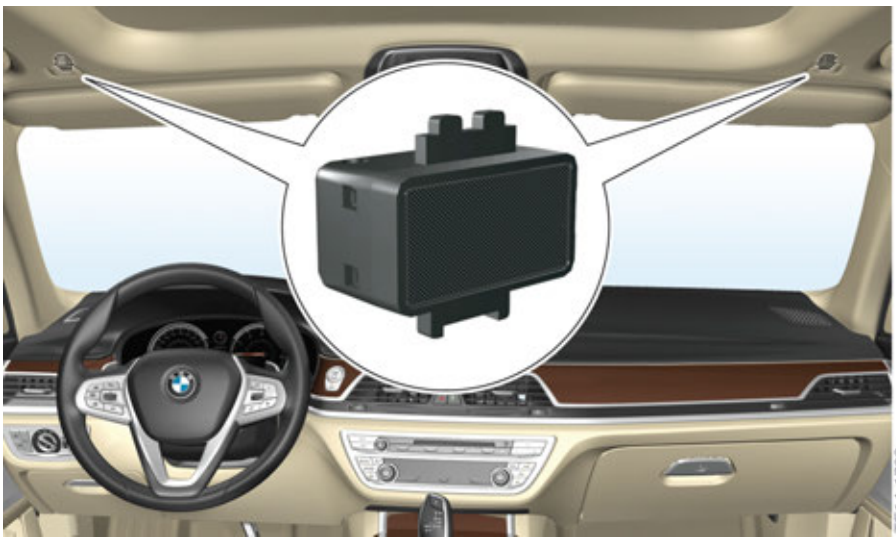
5. Speakers and Amplifiers

5.3.5. Microphone

The speed-dependent volume adjustment function used in other speaker systems (Speed Volume) is realized in the Bowers & Wilkins Diamond Surround Sound System by means of a microphone in the vehicle interior. The microphone also helps control equalizing for the Bowers & Wilkins Diamond Surround Sound System. The function is called Dynamic Equalizing Control.

The automatic adaptation takes place independently of the noise that can be heard in the passenger compartment, such as driving and wind noise. These are measured with the help of a microphone.

The microphone on the **driver' side** is used as a microphone for volume adjustment and equalizing.



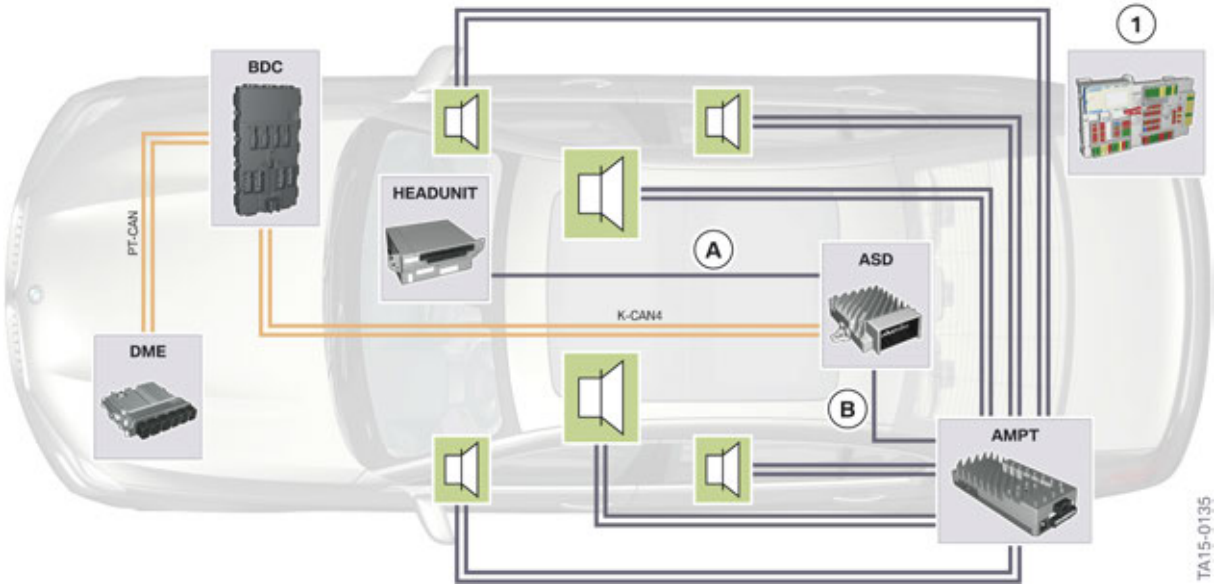
The microphone on the driver's side (left-hand drive vehicle) is used for the High End audio system in the G12

If the microphone or High End amplifier (AMPT) is replaced, the microphone must be **recalibrated** with the BMW diagnosis system.

G12 Audio Systems

6. Active Sound Design

With Active Sound Design (ASD), the sound of the respective engine is not changed but is emphasized depending on the selected driving mode.



ASD in the G12

Index	Explanation
1	Rear right power distribution box
A	Audio signal of the headunit
B	Audio signal of the Active Sound Design (ASD) control unit (processed audio signal for perfect engine sound)
AMPT	Amplifier Top
BDC	Body Domain Controller
DME	Digital Motor Electronics
Head unit	Headunit High 2

The engine control unit controls the Active Sound Design (ASD) of the vehicle using characteristic data such as engine speed, load or driving speed. The ASD generates the optimum sound design for the respective driving profile and forwards these sound files to the speaker system in the vehicle interior via the hi-fi amplifier.

The ASD can be temporarily deactivated during a test drive (noise analysis drive) by means of the BMW diagnosis system ISTA. However, permanent deactivation of the ASD is **not** possible. If the ASD is deactivated using the BMW diagnosis system with the ISTA function "ASD muting ON", the ASD will remain switched off only until the next terminal change.

A deactivated Active Sound Design is activated again after the next terminal change.

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